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THESIS

NAVAL AVIATION SUPPORT EQUIPMENT
ACQUISITION POLICIES AND PROCEDURES
IN THE 1980'S

by

Thomas Michael Vandenberg
and
Terry Lynn Merritt

September 1984

Thesis Co-Advisors: W.R. Talutis
J.E. Ferris

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As weapon systems become increasingly complex and costly, the variety of support equipment needed to maintain them has increased dramatically. One result of this proliferation of support equipment is the recognition of the need for an effective and efficient management and acquisition process. The objective of this research effort is to examine the procedures which have been established for the management

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Naval Aviation Support Equipment Acquisition Policies and Procedures in the 1980's

by

Thomas Michael Vandenberg
Lieutenant, United States Navy
B.S., Eastern Illinois University, 1977

and

Terry Lynn Merritt
Lieutenant, United States Navy
B.S.B.A., University of Delaware, 1977
B.A.A.S., University of Delaware, 1977

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I. INTRODUCTION

A. INTENT

As weapon systems have become increasingly more complex and costly, the number and types of support equipment to maintain them have also risen dramatically. One result of this proliferation of support equipment is the requirement for an effective and efficient management and acquisition process.

The intent of this thesis is to examine the procedures which have been established for the acquisition of Naval Aviation Support Equipment and to discuss what impact recent changes in federal acquisition policy mandating competition have had on this process.

This thesis specifically examines the acquisition process for both common and peculiar support equipment at the Naval Air Systems Command. It attempts to determine the duties and responsibilities of each participant and to highlight possible problem areas. This thesis will also attempt to offer recommendations to reduce the impact of the various problems associated with the acquisition of support equipment.

B. APPROACH

The research methodology used consisted of reviewing applicable instructions, directives, and other written

reports and interviewing personnel at Naval Air Systems Command Headquarters and Naval Air Engineering Center, Lakehurst NJ both using telephone and personal visits.

C. DEFINITIONS

The following terms are defined as they are used in the context of this thesis:

1. Weapon System: A composite of equipment, skills, and techniques that form an airborne instrument of combat or support for an airborne instrument of combat that has a flight vehicle as its major operational element. The complete weapon system includes an end item, all installed equipment, related facilities, material and personnel required for the operation of the system [Ref. 1: p. B-17].
2. Systems Acquisition Process: The process consisting of planning, designing, testing, producing, and deploying a weapon system. The process covers the period from initial conception to retirement of the weapon system.

D. ASSUMPTIONS

Since this thesis focuses on the federal acquisition process, the Planning, Programming, and Budgeting System (PPBS) is mentioned throughout the text. This topic is not developed in great detail based on the assumption that the reader has a working knowledge of the requirements and

procedures involved in the PPBS. However, the fund codes referred to in this text are identified in Appendix C.

E. ORGANIZATION

This thesis is divided into an introduction, three development chapters and a final chapter of conclusions and recommendations. Chapter II provides an overview of the support equipment acquisition process and involved agencies. Chapter III outlines current federal acquisition policy on competitive procurement and its impact on the support equipment acquisition process. Chapter IV discusses the topics outlined in the previous two chapters.

Three appendices are also included. Appendix A provides an overview of the Major Weapon System Acquisition Procedures and outlines the life cycle of a program. Appendix B provides an example of the Support Equipment Recommendation Data required prior to the initiation of any support equipment acquisition. Appendix C identifies the various funding categories most commonly used in support equipment acquisition.

II. SUPPORT EQUIPMENT ACQUISITION

The large number of complex aircraft and associated aircraft systems in current use require a wide variety of support equipment for servicing, handling, starting, testing, and adjustment. Maintenance support for the various aircraft systems is provided by support equipment (SE), which is divided into two broad categories: Common Support Equipment (CSE) and Peculiar Support Equipment (PSE). CSE may be used on more than one component, subsystem, or system that is applicable to more than one weapon system. Some examples are tow tractors, service carts, Versatile Avionics Shop Test (VAST), and maintenance test stands. PSE is only compatible with a single aircraft type or specific aircraft system. Some examples are maintenance adapters, test program sets, and antenna couplers.

The fact there are approximately 500 Naval Aviation activities maintaining over 30 different types of aircraft all of which require support equipment to perform their mission illustrates the magnitude of the aviation support equipment program. The number and type of support equipment in use by any activity, at the organizational or intermediate level, is dependent on the number and types of aircraft being maintained. A typical organizational level maintenance activity will have 500 different types of

support equipment, common and peculiar, 25% of which will be avionics support equipment. At the intermediate level, a typical Aircraft Intermediate Maintenance Department will have from 3000-4000 different types of support equipment depending on whether it is ashore or afloat. For an intermediate level activity, the ratio of non-avionic to avionic support equipment is normally 2 to 1 [Ref. 2]. The combined support equipment requirement at the organizational and intermediate maintenance levels alone totals over 17,000 end items.

The research, development, acquisition, and management of both CSE and PSE are conducted by the Naval Air Systems Command (NAVAIRSYCOM).

A. NAVAIR FUNCTIONAL ORGANIZATION

The organizational structure and responsibilities of the divisions in NAVAIR as they relate to support equipment are shown in Figure 2-1. As shown, all divisions in NAVAIR are either directly or indirectly related to support equipment. However, AIR-310, AIR-417, AIR-552, and the Support Equipment Department of the Naval Air Field Support Activities are specifically concerned with the design, development, production, management, and deployment of support equipment.

1. AIR-01

The overall responsibility for the development, acquisition, and management of a proposed weapon system

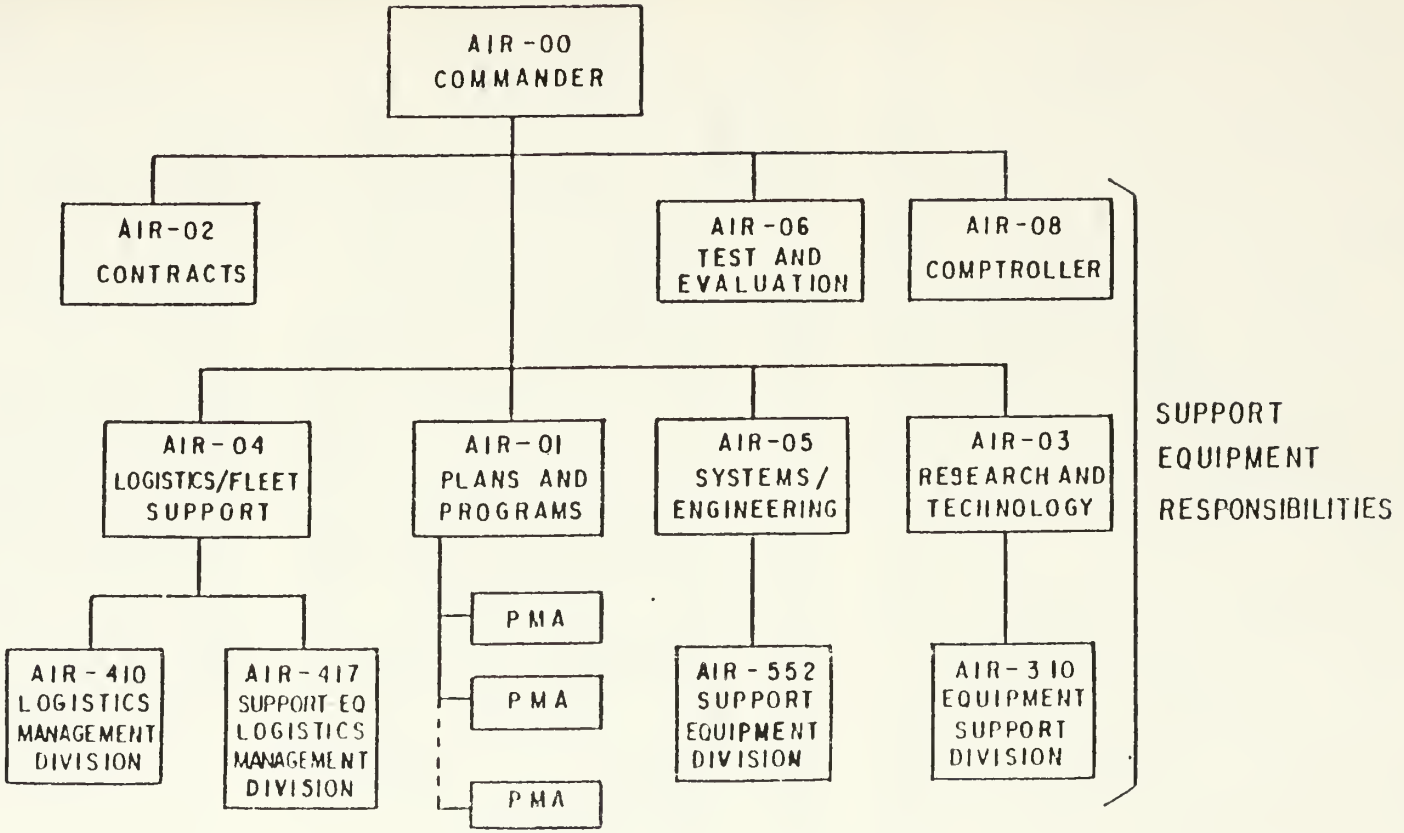


Figure 2-1. NAVAIR Headquarters Organization for Support Equipment [Ref. 3: p. 2-2]

lies in AIR-01, Planning and Programs. Under the cognizance of AIR-01, a specific Project Manager, Aircraft (PMA) is assigned for each separate weapon system. The PMA directs, controls, and integrates the weapon system into the fleet. Also, the Project Manager is supported in these duties by Assistant Project Managers (APM) representing other NAVAIR functional divisions, particularly the Assistant Commander for Research and Technology (AIR-03), the Assistant Commander for Logistics/Fleet Support (AIR-04), and the Assistant Commander for Systems and Engineering (AIR-05).

2. AIR-03

The Assistant Commander for Research and Technology (AIR-03) is responsible for the conceptual and advance development of CSE. The conceptual development is administered by AIR-310 in conjunction with various field support activities. These field activities provide developmental recommendations and resource allocation proposals to AIR-310 who incorporates them into the established Program Objective Memorandum and budget proposals.

3. AIR-04

Comprised primarily of logisticians, AIR-04 is responsible for the integrated logistics management and fleet support of proposed and existing weapon systems. Within AIR-04, the Logistics Management Division (AIR-410) coordinates the Integrated Logistics Support (ILS) efforts for both proposed and existing aircraft. Also under the

cognizance of AIR-04, the Support Equipment Logistics Management Division (AIR-417) provides the required logistical expertise in the area of support equipment. In addition to developing a comprehensive ILS plan for a new weapon system support equipment, AIR-417 administers an installed support equipment program, directs the maintenance, calibration repair, and overhaul of SE, and budgets for the logistics elements involved in fleet support. Further, AIR-417 is the Aircraft Maintenance Material Readiness List (AMMRL) program manager and the inventory manager for all support equipment with the exception of items under the management control of Program Support Inventory Control points.

4. AIR-05

Engineering and systems support through full scale development is provided by AIR-05. The Director of the Support Equipment Division (AIR-552) is the designated System Program Manager for Support Equipment (SPM-SE) and as such is responsible for coordinating, planning, programming, and the overall management of support equipment design, development, acquisition, and support.

5. NAVAIR Field Support Activities

There are three main field support activities that supply technical assistance to the support equipment managers in the areas of engineering, logistics, technical base development, test and evaluation, and production. They are the Naval Air Engineering Center (NAEC), the Naval Avionics Center (NAC), and the Pacific Missile Test

Center (PMTC). Other Navy field activities or commercial engineering support may be utilized in the development and acquisition of support equipment, particularly in the case of common support equipment.

B. NAVAIR MATRIX ORGANIZATION

1. Background

Concurrent with the increasing sophistication of Naval aircraft in the 1960's was an increasing awareness that logistic support was critical to the operational readiness of the fleet. In recognition of this requirement the Navy issued WR-30 in 1963. This Weapon Requirement was the first in a series of documents which developed a process in which all weapon system support elements are integrated into a total systems approach, now called Integrated Logistics Support (ILS). Support equipment was identified as one of the nine logistics elements which, in accordance with WR-30, were to be coordinated with and integrated into planning on any NAVAIR weapon system project. Clearly, support equipment was assuming a role of increased importance in the weapon system acquisition process, and in 1967, NAVAIR recognized this importance by designating the Director of the Support Equipment Division as the Support Equipment Program Manager. This occurred less than one year after the division was established [Ref. 4]. Support equipment prominence was enhanced in the following years by the creation of several organizations which dealt

exclusively with aviation support equipment. In June 1967, the Support Equipment Department was organized at the Naval Air Engineering Center (NAEC) to provide centralized engineering support. In August 1968, the Naval Air Test Center (NATC) established a Support Equipment Test and Evaluation Branch to ensure the comprehensive testing of all support equipment prior to fleet introduction. And, in March 1970, a Support Equipment Logistics Division, AIR-417, was established at NAVAIR to manage the logistic requirements of all aviation support eqipment [Ref. 4].

It was the intention of NAVAIR to use a matrix organizational structure to integrate these support equipment organizations into the established weapon system project management process. The support equipment program was being managed by an Assistant Project Manager for Logistics supported by Logistic Managers for Support Equipment and other Logistic Element Managers. All of these divisions were at the same functional level in NAVAIR. Reporting directly to and totally funded by the Project Manager, these divisions operated relatively independently of each other. As a consequence, the Program Manager for Support Equipment did not in actuality control the support equipment program as it was intended when he was chartered in 1967, nor was a systems approach to support equipment life cycle management in evidence [Ref. 4].

This management structure remained in place until the late 1970's at which time the problems associated with

weapon system acquisition such as increased cost, poor operational availability, and late delivery were given a great deal of visibility both publicly and Congressionally. During this period, the funding for the F-14 program was reduced several times due to high life cycle costs and low aircraft operational availability [Ref. 4]. The problems associated with weapon system acquisition were in large part caused by the fact that logistic elements had often been the target of project budget cuts to accommodate an unplanned requirement on the overall weapon system. Such actions were possible, since each Project Manager, Aircraft had total control of project support equipment funding and planning.

Recognizing the fact that all logistic elements including support equipment were critical to the success of the weapon system, NAVAIR implemented several changes in the support equipment acquisition process with the F-18 project. Most notably, the Assistant Project Manager for Logistics and the Program Manager for Support Equipment were given funding and review authority over those divisions which supported them. The Program Manager for Support Equipment was designated a System Program Manager for Support Equipment and specific responsibilities of the position were outlined. This led to the development of two separate matrix organizations, one for logistics headed by the Assistant Project Manager for Logistics and one for support equipment

acquisition and management headed by the System Program Manager for Support Equipment. Still in use today, these two organizational structures draw on the available expertise of both AIR-04 and AIR-05 and are intended to provide early and continuous integration of logistics and planning into the support equipment life cycle. To ensure that logistic support remains an integral part of the weapon system acquisition process concurrent approval from both divisions is required at various points throughout the acquisition process [Ref. 1].

2. Support Equipment Acquisition Matrix Organization

NAVAIR currently uses the program matrix organization superimposed on the formal organizational structure to ensure efficient, timely, and cost effective acquisition of support equipment. This approach focuses on the project manager as the consolidation point for all program elements which contribute to the successful introduction of a weapon system into the fleet. It is the primary purpose of the project manager to integrate the individual efforts of the various divisions of NAVAIR into a cohesive team effort. In the case of support equipment, the PMA works directly with the Director, Support Equipment Division (AIR-552), who is the designated System Program Manager (SPM) for Support Equipment. As required, a System Program Manager is appointed by the Commander, Naval Air Systems Command for specific NAVAIR programs within designated commodity areas (e.g.,

support equipment) which are less than major systems but are technically related to one or more weapon systems and require intensified management [Ref. 5]. The System Program Manager for Support Equipment, who by charter has the same responsibilities and authority with regard to support equipment as the PMA has for the weapon system, acts as the overall coordinator for support equipment [Ref. 6]. To effectively achieve this goal, the Director, Support Equipment Division organizes a Project Management Team (PMT) consisting of an Acquisition Manager (AM) from AIR-552, a Logistics Manager (LM) designated by AIR-417, and a Logistics Requirements Generation Team (LRGT) selected by AIR-417. The designated Acquisition Manager (AIR-552) is tasked with the acquisition and management of support equipment in specific commodity areas such as aircraft handling equipment and propulsion systems. It is not unusual for an Acquisition Manager to be involved with more than one program when commonality of support equipment exists between weapon systems.

Reporting to both the PMA and AM-SE, the Logistics Manager (LM) appointed by AIR-417 is responsible for all matters concerning the Integrated Logistics Support (ILS) of the end item. The Logistics Manager is supported by the various Logistic Element Managers in their respective areas. Both the Logistics Manager and the Acquisition Manager are provided technical support by Naval Air Engineering Center (NAEC) in planning a reasonable development schedule.

Figure 2-2 shows the various relationships in this matrix organization. This team approach provides two distinct advantages. First, it forces the recognition of support equipment at an institutional as well as functional level of management. Consequently, if tradeoffs must be made at any point in the life cycle of the weapon system, they are reviewed at an appropriate level of management. Secondly, NAEC and AIR-04 allow the SPM-SE to concentrate on planning and coordination by performing the detailed and technical research support tasks. However, this organizational structure requires a strong manager to effectively integrate the efforts of the personnel drawn from the many diverse divisions.

3. Integrated Logistics Support Organization

The Integrated Logistics Support (ILS) management of a given aircraft/weapon system is the second matrix organization within NAVAIR (see Figure 2-3). Headed by an Integrated Logistics Support Manager (ILSM) appointed by AIR-04, the Integrated Logistic Support Management Team (ILSMT) is comprised of representatives from both AIR-04 and AIR-05 and is supported by the various field support activities. The ILSMT expands the data generated by the Logistics Requirement Generation Team (LRGT) into the quantitative logistics support requirements to be included in the project management and decision making documentation. AIR-552 assigns a Logistics Element Manager for PSE (LEM-SE)

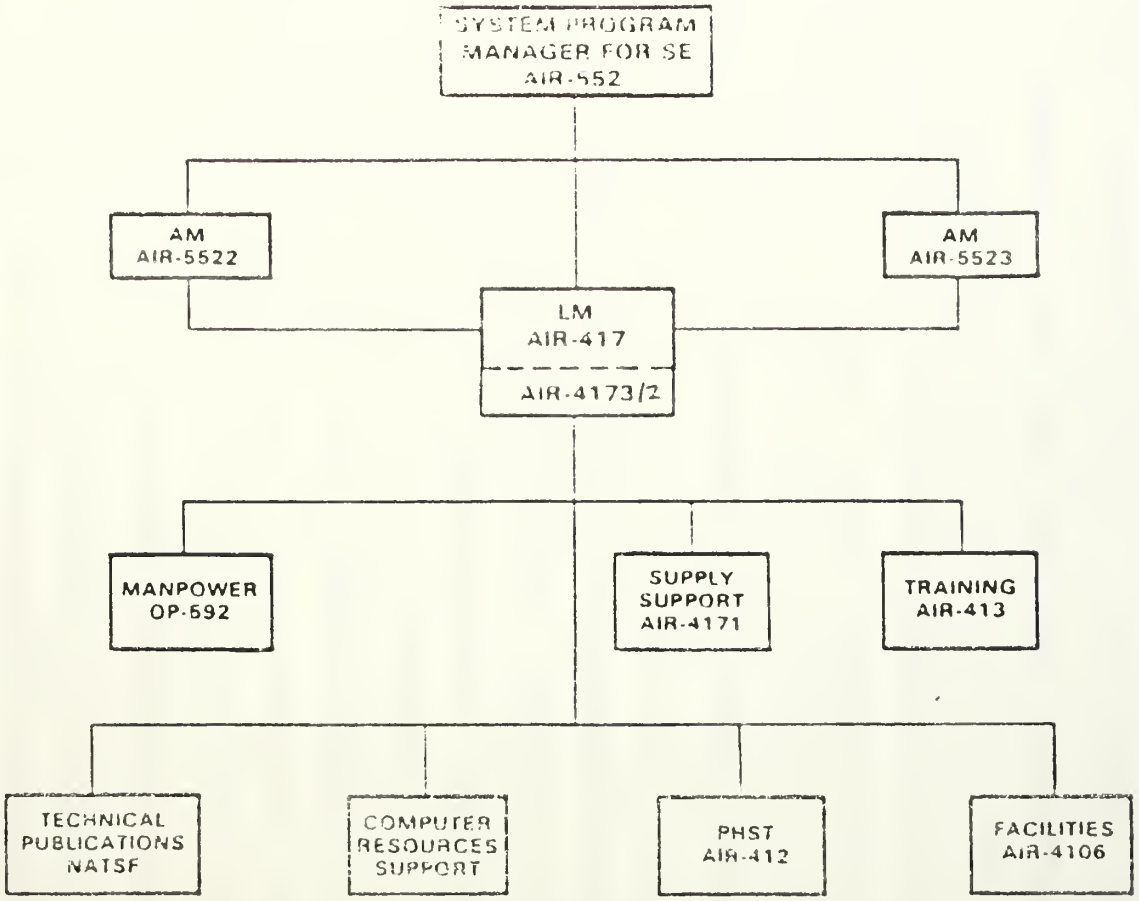


Figure 2-2. Support Equipment Acquisition Matrix Organization [Ref. 1: p. 4-3]

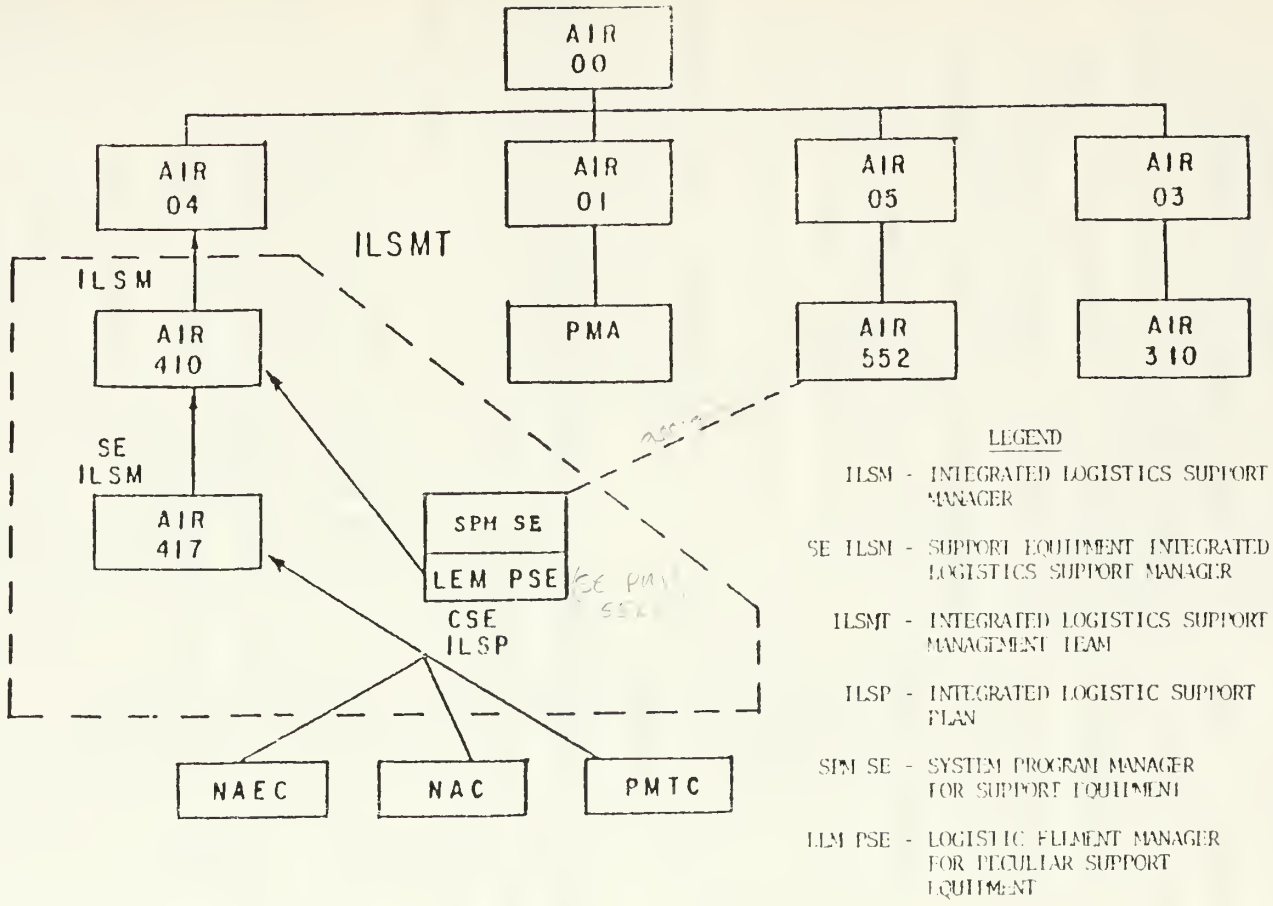


Figure 2-3. Integrated Logistic Support Matrix Organization [Ref. 3: p. 4-3]

who is actively involved in coordinating all peculiar support equipment logistical requirements. Due to similar technical requirements, the System Program Manager for Support Equipment is normally assigned as the Logistics Element Manager for SE. The contractor, in conjunction with field support activities, develops an Integrated Logistics Support Plan (ILSP) for CSE which is evaluated by the Integrated Logistics Support Manager of Support Equipment (ILSM-SE) in AIR-417 for applicability. The Integrated Logistics Support Manager for Support Equipment (ILSM-SE) works closely with the Logistics Managers (LM) to not only ensure that no duplication in equipment exists but, also, that a cohesive logistics plan for all aspects of support equipment is developed.

4. Aircraft Maintenance Material Readiness List Program

The Aircraft Maintenance Material Readiness List (AMMRL) Program provides data for the effective management of support equipment at the various levels of aircraft maintenance. As shown in Figure 2-4 this program is primarily managed in a matrix organization by AIR-417, with technical inputs from AIR-552, the Aviation Supply Office (ASO), and the aircraft controlling custodians who are those commands designated by the Chief of Naval Operations (CNO) to exercise administrative control of assignment, logistic support, and employment of aircraft within specified commands. The AMMRL program encompasses over 17,000 end items

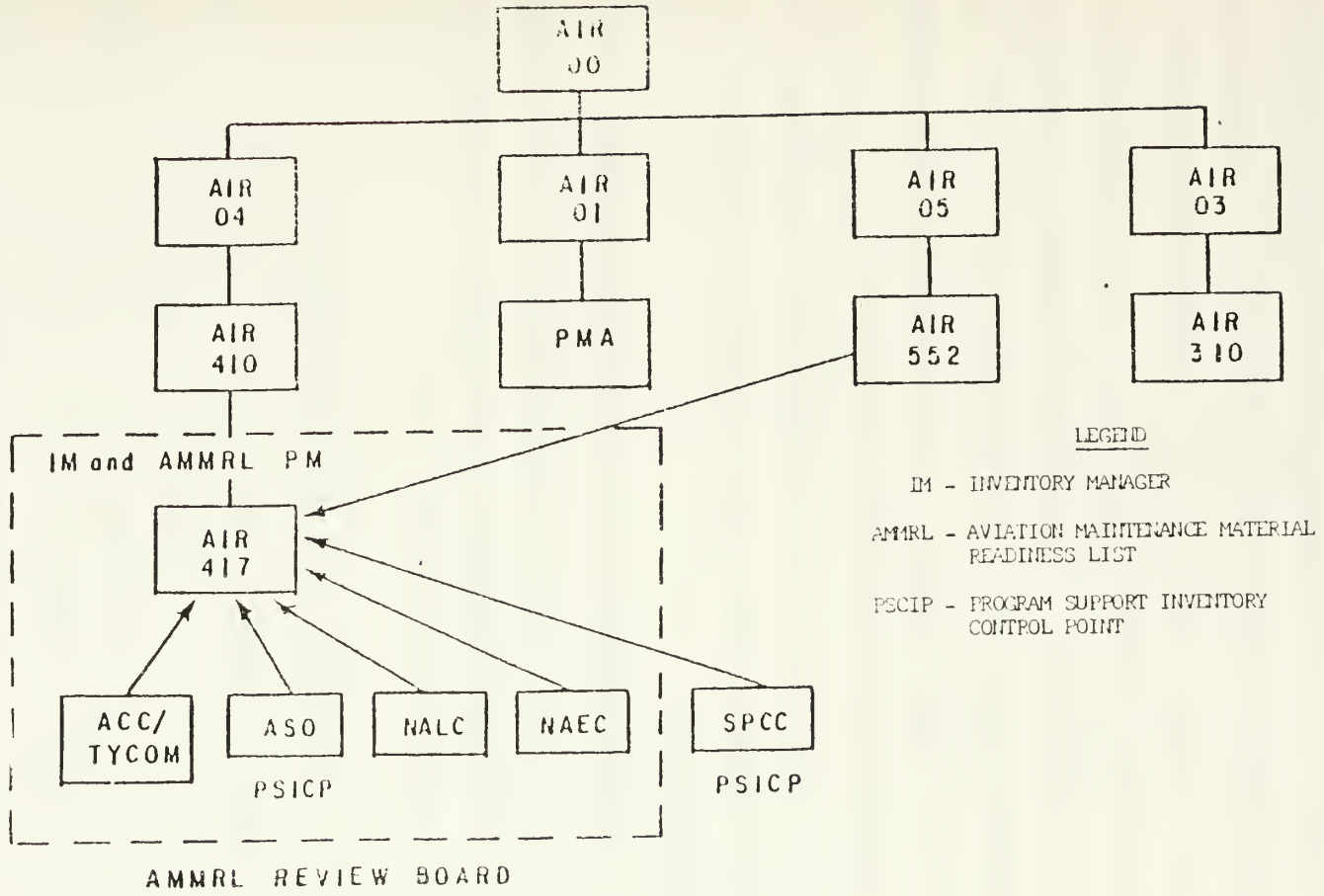


Figure 2-4. Aircraft Maintenance Material Readiness List Program Matrix Organization [Ref. 3: p. 2-8]

of support equipment utilized by Navy aircraft maintenance activities [Ref. 7]. This program also considers ship and air station base loading configurations and the requirements for airframe configurations, power plants and avionics systems to insure complete planning for support equipment requirements. The principal purpose of the program is the documentation of data and in-use asset information concerning support equipment [Ref. 8]. This information is used in the determination and establishment of SE allowance requirements for organizational and intermediate level maintenance activities, the distribution of in-use assets, as a base for budgeting of SE requirements, and as a measurement of material readiness.

These various matrix organizations integrate logistics, engineering, and management expertise to facilitate support equipment management within the functional organizational structure of NAVAIR.

C. ACQUISITION PROCEDURES FOR SUPPORT EQUIPMENT

With the second largest program budget in NAVAIR, support equipment follows an orderly acquisition process predicated on life cycle management and a continued emphasis on integrated logistics support for the end item. This acquisition process follows the major weapon system procedures outlined in DODD 5000.1, shown in detail in Appendix A, but is adapted to the peculiarities of support equipment by NAVAIR Support Equipment Branch Instruction 1-84.

Figure 2-5 shows this support equipment acquisition process. As indicated, the life cycle of support equipment acquisition is divided into six phases separated by key decision points or milestones. These phases are conducted concurrent with the budgeting process.

The acquisition cycle is initiated by the identification of a need for additional support equipment by the fleet, NAVAIR Headquarters (AIR-552, 417, 310), a field support activity, or a contractor involved in weapon system development. This requirement may be for support equipment on a weapon system in development, the modification of an existing system to satisfy a new weapon system requirement, support equipment for other support equipment systems or to increase standardization among existing support equipment systems. At this point, the proposed support equipment requirements are reviewed for incorporation into the Program Element Master Plan (PEMP). This review concentrates on the operational necessity of the proposed end item and the viability of existing alternative courses of action. The PEMP is the overall guidance and planning document for the development of support equipment. To facilitate the management of support equipment, the PEMP is divided into discrete groups such as aircraft handling vehicles and nondestructive inspection (NDI) equipment.

Prior to the Concept Exploration Phase, the support equipment project is supported by Research, Development, Testing, and Evaluation, Navy (RDT&E,N) funds. Once the

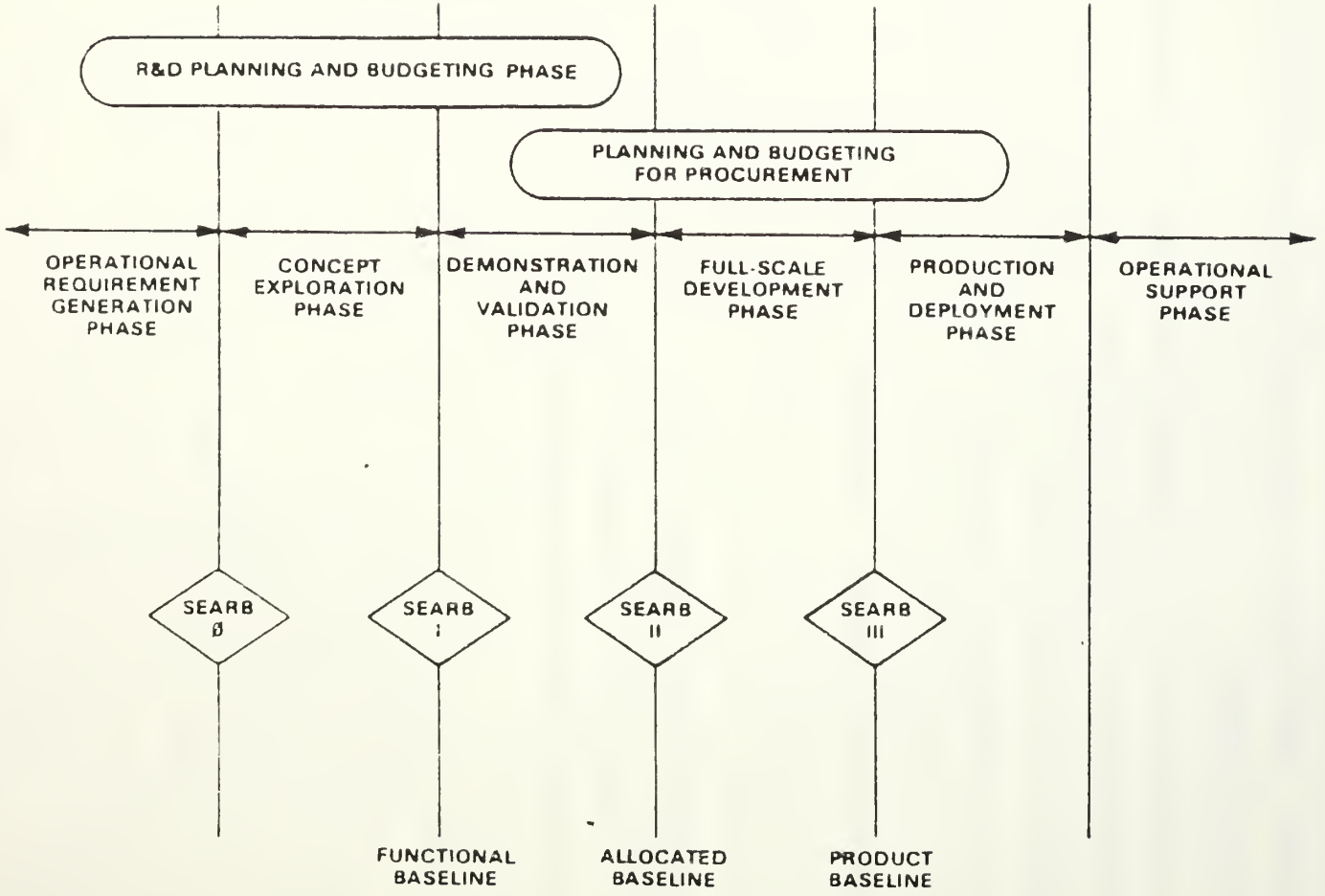


Figure 2-5. Support Equipment Life Cycle [Ref. 1: p. 1-2]

funding has been approved, the Concept Exploration Phase begins. The purpose of this phase is to explore alternative designs with an emphasis on competition and innovation. It is at this point that AIR-552 establishes the Project Management Team. Additionally, during this period the Logistics Support Analysis (LSA) process is initiated, the Acquisition Plan is developed, the contract for conceptual development is awarded, and the functional baseline of the support equipment end item is established.

During the Demonstration and Validation Phase, the findings of the previous phase are verified through test and evaluation of the experimental model defined by the functional baseline. During this phase, a contract is also awarded for advanced development. The purpose of the Advanced Development contract is to conduct a test and evaluation of the experimental model, to refine the Integrated Logistics Support requirements, to evaluate cost and schedule estimates, and to verify performance specifications. Additionally, the Test and Evaluation Master Plan (TEMP) is initiated, design reviews are conducted, the Logistics Support Analysis and the budgeting process continue, and the allocated baseline, which defines the performance requirements of lower level components, is established.

The objective of the next phase, Full Scale Development, is to establish the product baseline and complete the design for selected alternatives. The Integrated Logistics

Management Team is formed at this time to develop quantitative and qualitative logistics support requirements for the program. The various ILS requirements are further developed, and a Technical Evaluation (TECHEVAL) and a Fleet Evaluation (FLEETEVAL) are conducted on the final system design. Subsequent to these evaluations, a Maintenance Plan for the support equipment item is developed.

During the Production and Deployment Phase, the goal is to produce and field an end item that can be operated and supported by the fleet. Even though the ILSMT reviews continue, all required ILS elements should have been provided by the time of fleet introduction.

Finally, the Operational Support Phase covers the period from fleet introduction to equipment retirement. During this phase, modifications, Service Life Extension Programs (SLEP's), and in-service Engineering Change Proposals (ECP) are performed as identified. Also new support equipment requirements are initiated.

The end of each phase in the acquisition process is marked by a key decision point/milestone. At each milestone the operational need is reaffirmed, the events of the previous phase are reviewed for accuracy and completeness, and the resources are committed to meet the planned requirements of the next phase. These decisions are made by the Support Equipment Acquisition Review Board (SEARB) which consists of technical representatives from AIR-310, 417, and 552.

In all support equipment acquisitions, the acquisition process is tailored in an attempt to minimize the cost and time involved to provide an end item capable of meeting operational needs [Ref. 1: p. 1-2]. Not all support equipment acquisitions proceed through each phase and when practical, entire phases or portions thereof may be eliminated. The actual amount of variation in this process is highly dependent on the type of support equipment, either Peculiar Support Equipment (PSE) or Common Support Equipment (CSE) that is being procured.

1. Peculiar Support Equipment Acquisition

Supporting only one aircraft or system, Peculiar Support Equipment is normally developed in conjunction with a proposed weapon system in the following manner. After a weapon system is approved for Full Scale Development the prime contractor is required to submit an Integrated Logistics Support Plan (ILSP) to AIR-04 which includes a Logistics Support Plan and Level of Repair Analysis (LORA). Prior to submission of the Integrated Logistics Support Plan, the Assistant Project Manager for Logistics (APML) draws personnel from all ILS divisions to form the Resident Integrated Logistics Support Detachment (RILSD). The objective of the RILSD is to monitor and guide the ILS effort at the contractor site by providing a continuous on-site technical liaison through the deployment phase. The efforts of the RILSD are critical to the successful

development of a realistic Integrated Logistics Support Plan. Subsequent to the submission of the Integrated Logistics Support Plan, the contractor formally identifies specific support equipment requirements using a standard set of data titled Support Equipment Recommendation Data (SERD). The SERD is formatted to provide a description of the end item by specifying the weapon system function which requires support, the means by which this requirement can be filled, and procurement, logistics and allowance data. Appendix B shows the actual data formats. Consistent with AIR-552's goal to maximize standardization, the contractor is required to use the Technical Information File (MILHDBK 300) and the Standard General Purpose Electronic Test Equipment File (MILSTEP 1364) to identify support equipment currently in inventory as possible end items to satisfy the identified requirements [Refs. 2,9]. NAEC reviews each SERD to determine if the requirements can be satisfied by any of the following:

1. Support equipment, either common or peculiar, that is in use or under development;
2. A commercial off-the-shelf product in government inventory;
3. A modification of existing support equipment;
4. Development of new support equipment.

This review is a manual search of the following listings and data bases:

1. MILHDBK 300, Technical Information File;
2. NAVAIR 16-1-525, Avionics Preferred Common Support Equipment;
3. NAVAIR 19-1-127, Non-Avionic Preferred Common Support Equipment;
4. MILSTEP 1364, Standard General Purpose Electronic Test Equipment;
5. Defense Logistic Service Center (DLSC) Preprocurement Search;
6. Engineering Data Retrieval System (EDRS), a computerized file of all in-use Naval Aviation Support Equipment.

All data elements listed on the SERD are used in this analysis, with the most critical ones being the performance specifications of the proposed support equipment item.

To minimize delay in the weapon system schedule, certain time constraints have been imposed on this process. A contractor must submit a SERD within 30 days after identifying a support equipment requirement, and conversely NAVAIR has 60 days in which to deliver approval on this request. After concurrence from both AIR-417 and AIR-552, the approving authority, Naval Air Engineering Center (NAEC), forwards the approved SERD to the Procurement Contracting Officer (PCO) for processing. The SERD process is shown in Figure 2-6.

In addition to the foregoing procedures, NAEC performs a Support Equipment Selection Analysis (SESA) as soon

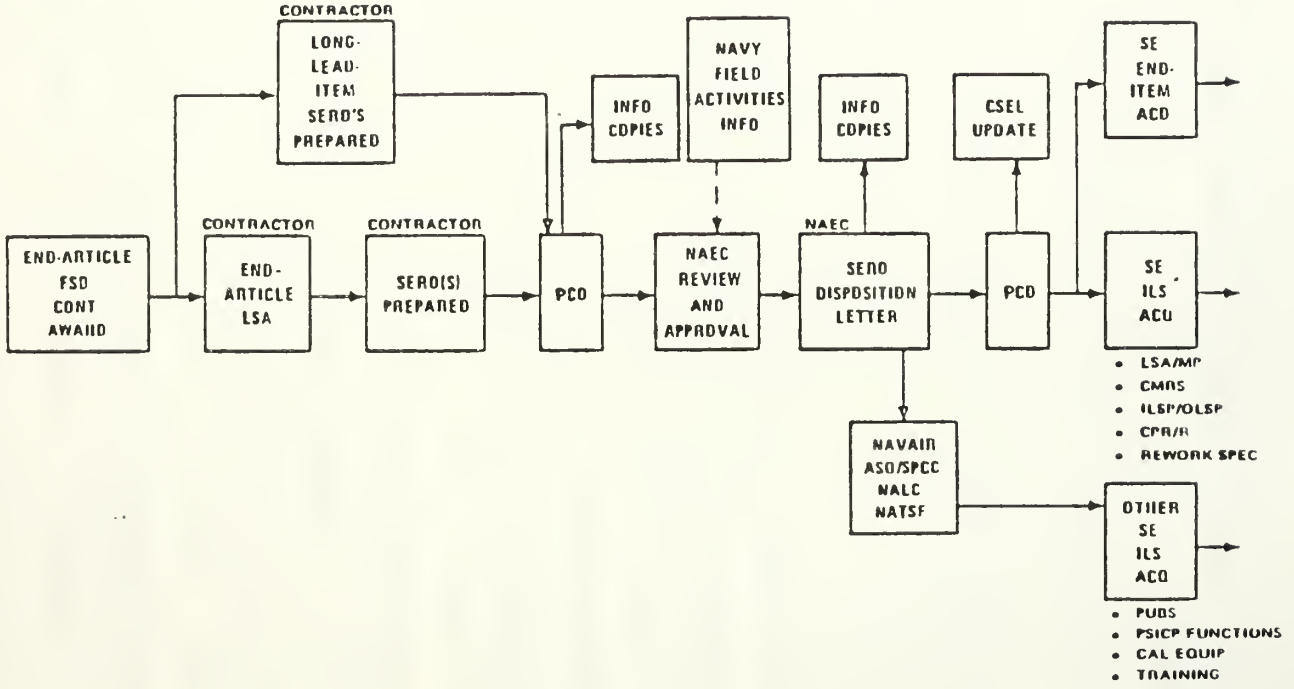


Figure 2-6. Support Equipment Recommendation Preparation, Review, and Approval Cycle Flowchart [Ref. 3: p. E-7]

as possible after the weapon system is approved for Full Scale Development to determine which systems or subsystems would be suitable for Automatic Test Equipment (ATE). The SESA views the avionics test requirements, the capabilities of the proposed equipment and the compatibility with current equipment in order to generate a set of viable options. These options are examined in view of their required maintenance workload and life cycle costs as well as their contractual and technical risks. A final proposal is made by NAEC to develop new ATE and a SERD is submitted as necessary.

The actual acquisition process then follows the procedures and life cycle outlined in NAVAIR Support Equipment Branch Instruction 1-84 with the System Program Manager for Support Equipment (SPM-SE) acting under the direction of, and receiving funding from, the Project Manager (PMA). The development of a support equipment end item lags behind the actual aircraft development as a consequence of being introduced at the Full Scale Development Phase of the major weapon system life cycle. The support equipment acquisition process may be tailored so that the end item is advanced to the Deployment Phase without a TECHEVAL to ensure that the weapon system is introduced to the fleet on schedule. The elimination of the TECHEVAL allows the Project Manager, Aircraft to meet the short range goal of fleet introduction. However it can create a far

greater problem for the end user, as untested support equipment may either be unable to perform its intended function or to function at all. Otherwise, there is minimal change in the established acquisition procedures to accommodate peculiar support equipment.

2. Common Support Equipment Acquisition

A requirement for Common Support Equipment may be generated by the weapon system contractor, the field support activities, or NAVAIR Headquarters (AIR-310, 417, 552) in the same manner as those for Peculiar Support Equipment. Regardless of the source, a SERD is required in all cases, and the acquisition process follows the procedures outlined in NAVAIR Support Equipment Branch Instruction 1-84. The amount of tailoring needed to validate and meet these requirements is dependent upon the developmental stage of the Common Support Equipment end item and the acquisition phase at which the requirement is initially addressed. In many cases the Common Support Equipment end item is already in use and many acquisition phases may be shortened or eliminated.

Even though AIR-552 is the System Program Manager for Support Equipment (SPM-SE), Conceptual and Advanced development of Common Support Equipment is directed and funded by AIR-03 through AIR-310. These projects are normally initiated by NAEC in conjunction with AIR-552. Whether the research is conducted at AIR-310 under the

cognizance of NAEC, at NAEC or by other field or commercial activities, the programs are monitored by the Support Equipment Department of NAEC. These programs are not necessarily related to specific weapon systems, and there is little evidence to indicate they have a direct effect on specific weapon system design in the near term [Ref. 3]. There are periodic reviews of these programs and modifications are suggested as applicable.

Full Scale Development efforts for Common Support Equipment are directed and funded by AIR-552, the System Program Manager for Support Equipment. Requirements for Full Scale Development may be identified by any of the following means:

1. migration of a project from the advanced development stage,
2. the in-house efforts of AIR-552, 417, NAEC or fleet inputs, or
3. through the SERD process on a developing weapon system.

The purpose of these projects is the standardization of equipment through the replacement of obsolete equipment, upgrading of the current inventory, and the development of common types of equipment to satisfy emergent needs. Since a significant number of Common Support Equipment items are already in use or have a valid Technical Data Package, they require only slight modification if any at all to meet the

identified requirement. Consequently, a large number of Common Support Equipment projects are able to eliminate the earlier stages and are initiated at the Full Scale Development stage. Subsequent to development, Common Support Equipment follows the established acquisition procedures through the retirement phase.

As System Program Manager for Support Equipment (SPM-SE), AIR-552 is responsible for the overall management of support equipment including budgeting. In the case of Peculiar Support Equipment, funds are directed to AIR-552 by the Project Manager for specific line items. For Common Support Equipment, funding is requested and allocated directly to AIR-552. Even though many funding categories are used, the allocated funds primarily fall into one of the following categories: RDT&E 6.2, 6.3, 6.4, or APN 1-4 & 7 as defined in Appendix C. Allocated funds are those funds requested by, and under the total control of, the System Program Manager for Support Equipment (SPM-SE). Use of allocated funding affords AIR-552 the flexibility to make the tradeoffs necessary to field an operational end item with the appropriate logistics support.

Over the past decade the ratio of allocated to directed funding for support equipment has steadily increased. Implicit in this rise of allocated funding is that the ratio of Common Support Equipment to Peculiar Support Equipment has also increased dramatically.

Originally this trend was initiated to overcome the redundant test capabilities and lack of logistics commonality that resulted from the proliferation of PSE in the 1960's. As aircraft increased in complexity, particularly in the area of avionics, Common Support Equipment and Automatic Test Equipment were proposed as a solution to these problems.

The trend to standardize through common support equipment provides some distinct advantages to the weapon system project. It allows for a possible decrease in the life cycle cost by minimizing training and replacement part requirements. Since common support equipment is often commercially available or in use, the developmental stages of the acquisition are often eliminated abbreviating the support equipment life cycle. Therefore, the support equipment program length requires minimal tailoring to accommodate the weapon system Initial Operational Capability date. A normal byproduct of standardizing support equipment is a reduction in shop space requirements, since the functions of several items of support equipment are often consolidated in a single end item. This consolidation makes the maximum possible use of the restricted shipboard space [Ref. 9]. Consequently, CSE has evolved from the VAST system of the late 1970's to the Family of Functional Testers in use today and toward the proposed Consolidated Support System (CSS) to be introduced to the fleet in 1991.

The VAST system is a computer controlled test system used by intermediate level maintenance activities to process

certain avionics components. It is made up of a group of independent general purpose stimulus generators and measurement instruments called building blocks that are necessary to automatically test sophisticated avionics gear [Ref. 10]. It was designed to provide the following functions [Ref. 10: p. 35]:

1. Test difficult types of weapon system components;
2. Test complex avionic equipment with greater speed and accuracy;
3. Provide the flexibility to adapt to a new weapon system;
4. Realize long term savings of resources; and,
5. Decrease the amount of setup and tear down time through batch processing.

However, in use VAST did not provide a long range solution to the proliferation of support equipment. Even though it is a single multi-purpose common support equipment item, it requires a multitude of Interface Devices (ID) and Test Program Sets (TPS) to interface with the many avionics components of the various aircraft it is supposed to maintain. Not only are the Interface Devices and Test Program Sets costly but they are developed separately as the requirement arises [Ref. 9]. In actual use, the VAST has not exhibited the potential for product improvement [Ref. 9].

Including support equipment items such as CAT III D which tests electronic modules at the card level, and Hybrid

Test Sets, the family of functional testers provide a short range solution to the problems of the VAST system and the proliferation of support equipment. They emphasize the use of existing support equipment, segregate weapon repairable assemblies and system repairable assemblies, and provide support across aircraft by function such as radar or navigation/communications. Faced with a static design, supportability constraints, and a lack of transportability between testers, the family of functional testers is quickly becoming inadequate for fleet operational needs. Therefore, the CSS program provides a solution which addresses the problems faced by the family of functional testers by stressing standardization, functional commonality, flexibility, and increased reliability and maintainability. The CSS is an integrated group of ATE designed for supportability and rapid reconfiguration. Since it employes standardized software and hardware, CSS has the flexibility to accommodate a rapid change in technology with minimal risk of obsolescence.

D. SUMMARY

The procedures established for the acquisition of support equipment are consistent with the guidelines promulgated in DODD 5000.1. Even though this process consists of six separate phases from Concept Exploration to Deployment, not all support equipment acquisitions proceed

through every phase. The actual amount of variation in this process is highly dependent on the type of support equipment, common or peculiar, that is is being procured. Peculiar support equipment, being demand dependent on a developing weapon system, will normally proceed through all phases of the acquisition process with minimal tailoring. Common support equipment, on the other hand, is often a fleet tested item that does not require additional development. As a consequence, the common support equipment acquisition process may be tailored considerably based on the availability of information on the performance and configuration of the end item.

Consistent with the System Program Manager for Support Equipment's goal to optimize standardization, the ratio of common to peculiar support equipment has increased over the past decade. The trend toward standardization has allowed for a variety of possible benefits to both the System Program Manager for Support Equipment and the end user. The Consolidated Support System program currently in development embodies all of the objectives of the standardization program.

NAVAIR has established an orderly process for the acquisition of support equipment which conforms to the DOD guidelines for life cycle management and accommodates the peculiarities of the individual acquisition projects.

III. COMPETITION IN SUPPORT EQUIPMENT ACQUISITION

A. BACKGROUND

Over the past twenty five years as aircraft have become more costly and complex, federal acquisition directives have placed an increased emphasis on effectiveness and efficiency through competitive procurement. A clear mandate for the use of competition is evidenced in many of the regulations and directives issued during this period. The Defense Acquisition Regulation emphasizes the use of competition in the following manner:

> All procurement, whether by formal advertising or by negotiation, shall be made on a competitive basis to the maximum practicable extent.

Elaborating further the new Federal Acquisition Regulations state:

> Negotiated contracts shall be awarded on a competitive basis to the maximum practical extent. To this end:
>
> (a) Offers shall be solicited from the maximum number of qualified sources consistent with the nature of and the need for the supplies or services being acquired. Acquisition information shall be publicized.
>
> (b) Before negotiating a contract on a noncompetitive basis, the contracting officer is responsible not only for ensuring that competition is not feasible and practicable under the existing conditions and circumstances but also for acting whenever possible to avoid the need for subsequent noncompetitive contracts. This process shall include--
>
> (1) Examination of the reasons precluding competition for the current requirement; and
>
> (2) Taking steps to foster competition in the future, particularly with respect to the availability

> of complete and accurate data, reasonableness of delivery requirements, and possible breakout of components for competitive contracting.

At the DOD level the Secretary of Defense encourages the use of competition as follows:

> The Department of Defense components are to place maximum emphasis on competitive procurement. All personnel involved in the acquisition process from the first identification of the requirement through the execution of the purchase should recognize this responsibility. Contracts will be placed on other than a competitive basis only when clearly justified.

Throughout this period it has been the broad policy of the federal government to approach weapon system acquisition from a total systems viewpoint using competition as the main vehicle to ensure effective life cycle management. The most far reaching of these policy directives, OMB Circular A-109, advocates the competitive exploration of alternate design concepts and outlines the procedures to achieve this. It specifically requires that all federal agencies depend on competition, whenever economically beneficial, between similar or differing system design concepts throughout the entire acquisition process [Ref. 11]. Although it mentions the use of competition in the later stages of the acquisition process, the major emphasis of A-109 is placed on competition prior to full scale development, requiring justification for noncompetitive procurements up to that stage. It is evidently the intention of Circular A-109 to create a dynamic acquisition process flexible enough to accommodate both product changes and the peculiarities of

individual programs as well as ensure appropriate tradeoffs are made between cost, schedule, and performance over the entire life cycle of a weapon system.

The increased use of competition in weapon system acquisition is a direct result of the benefits it is believed to produce. Those benefits most commonly mentioned are as follows:

1. Improved product quality.
2. Lower unit costs.
3. Improved manufacturing learning curves.
4. Greater technological progress.
5. A broadened industrial base.
6. Increased surge and mobilization capacity.

In view of such claims, it is important to clearly define competition. In the strictest economic sense, it is a market structure in which there are a large number of firms, each with an insubstantial market share and an inability to influence price, producing a homogeneous product using identical production processes and perfect market information [Ref. 12].

However, in DOD acquisition and for the purpose of this thesis, competition is defined as an acquisition situation in which more than one firm is vying for a particular contract. In some phases of the acquisition process this competition may be based on non-price factors such as design, but price is almost always a limiting factor in all phases of acquisition.

As a system progresses through the acquisition cycle, the application of competition changes in two principal ways: in the type of benefits sought and in the cost, either monetary or time-wise, to support it. The net effect of these factors varies from program to program and should, in no way, be considered inconsequential.

B. COMMON SUPPORT EQUIPMENT

Competition in this sense is particularly applicable to the common support equipment acquisition process previously detailed. There are many common support equipment items for which there are several established sources of off-the-shelf items capable of competing on both design and price. Therefore, the common support equipment end item, in most cases, is a proven product with little or no development required to meet the identified mission. Consequently, sufficient technical data may be easily obtained on which to base competition in the Full Scale Development and Production Phases of the common support equipment life cycle. In fact, in 90% of the cases a proposed common support equipment item is either commercially available or in use by another service [Ref. 13]. Such availability virtually eliminates the Concept Exploration and Demonstration/ Validation Phases of the acquisition process and provides the program manager with additional flexiblity on both schedule and cost. In these cases, a firm fixed price production contract, based on the performance specifications

developed by the Naval Air Engineering Center (NAEC) in the Support Equipment Requirements Data review, may be formally advertised and competed. When available, a Technical Data Package (TDP) is used in place of the developed specifications.

These contracts normally include a provision for Technical Evaluation (TECHEVAL) on both design and performance parameters. Such testing at this point is critical to the eventual operational success of the support equipment item, as it is intended to ensure the compatibility with existing aircraft and an interchangeability, both physically and in performance, with similar common support equipment items. The verification of the design and performance specifications are particularly important to the end user who may be adversely affected by the results of multiple sourcing such as:

1. Additional spare part requirements;
2. Lack of interchangeability for either the end item or component parts; and,
3. Increased logistic element requirements (e.g., manpower, training, technical manuals).

There are, however, those cases in which common support equipment items must progress through all stages of the acquisition process. Even in these programs, it is the exception to encounter a sole source procurement to the prime weapon system contractor. A cost plus incentive type development contract is normally used to compete the common

support equipment design development, and a subsequent competitively awarded firm fixed price contract is used to compete the production. One of the required products of the development contract is a comprehensive Technical Data Package including drawings. This package may be used as Government Furnished Property (GFP) on the production contract. To validate the accuracy of the TDP, it is common practice to require first article testing prior to initiating the production contract.

In those exceptions when a support equipment contract is awarded to the prime weapon system manufacturer, it is normally for the modification of a proposed item of peculiar avionics equipment on a developing weapon system, and the modified equipment is so configured as to replace existing Automatic Test Equipment (ATE) as well as meet the identified mission.

C. PECULIAR SUPPORT EQUIPMENT

In applying competition to the acquisition of peculiar support equipment, several complications are immediately apparent. First, peculiar support equipment is demand dependent on a developing weapon system for which a definitized product baseline is required prior to the development of the support equipment item. However, in most cases, the peculiar support equipment acquisition process is initiated at a point in the weapon system development where the allocated baseline is barely defined. Without definitive weapon system specifications, it is clearly

difficult for a second source to exist competitively. Even though NAVAIR has begun to require a comprehensive Technical Data Package (TDP) as part of the original development contract, of the over 3000 peculiar support equipment design and development programs in process, virtually all are with the weapon system prime contractor. One exception is the F/A-18 program on which various Test Program Sets (TPS) for Automatic Test Equipment were competitively procured using government furnished specifications.

Secondly, there are some negative aspects of competition which act as disincentives for its use. They are an increase in total program cost, a lengthening of the overall schedule, an increased program complexity, and a requirement for an additional management effort. These delays may occur as a result of the time required for testing and source selection, the time needed to qualify an additional contractor and the additional management and administrative time requirements resulting from increased program complexity. Since program costs have a tendency to rise faster than inflation, the increased program length produces the risk of additional cost [Ref. 14].

For every kind of competition an additional investment may be required over what would be needed for sole source procurement even without schedule slippage. This is due in part to the increased management requirements generated by the increase in the number of contractors. Additional

planning, monitoring and administration is required to ensure that all sources are performing in accordance with the program guidelines [Ref. 14: pp. 12-22].

These drawbacks are magnified by the fact that the support equipment acquisition process trails that of the weapon system even though both fleet introduction dates are the same. To avoid the potential impact of these factors, almost all peculiar support equipment is initially procured from the prime contractor on a negotiated fixed price production contract for which the research and development was conducted as a provisioning line item on the weapon system contract.

As a byproduct of using the weapon system prime contractor, the research and development stages of the peculiar support equipment are often abbreviated based on information developed under the weapon system contract. Regardless of the extent of tailoring, in all cases a TECHEVAL is required prior to fleet introduction. These TECHEVALs are conducted at the designated field support activity on a priority basis with organizational level equipment having the highest priority [Ref. 15]. Various methods have been proposed to ensure their completion including an award fee based on the number of scheduled TECHEVALS successfully completed by a specified milestone in the major weapon system life cycle. To date however, no such clauses have been included in peculiar support equipment contracts.

In contrast, the reprocurement of peculiar support equipment often occurs through the use of breakouts. Breakout is a form of competition in which items are identified that are currently bought sole source from a prime contractor which could actually be bought directly from a subcontractor or even competitively from numerous sources. As weapon systems have become more complex, DOD has increased their reliance on the prime contractor. The use of breakouts for initial production as well as for reprocurement has increased to reverse this trend. However, some prime contractors are reluctant to support the use of breakouts by claiming that the technical data is proprietary or only available at a high price [Ref. 16: p. 24]. To maximize the benefits of breakouts, the original contract should include a provision for subsequent breakouts, since the contractor is the most willing at the time of his selection as a prime contractor to provide the data at the lowest cost. With the weapon system operationally deployed, the support equipment acquisition schedule is normally not as critical in the reprocurement contract as in the initial production contract. In this instance, a breakout provides the opportunity to develop some of the benefits of competitive procurement, particularly the development of a second source and a resultant reduction in the unit cost. The use of breakouts for the reprocurement of peculiar support equipment has reduced the cost of specific end items as much as 50% [Ref. 17].

D. SUMMARY

This chapter has reviewed the development of federal acquisition policy on competition and its impact on both common and peculiar support equipment. As this policy has moved toward the increased use of competition in the acquisition process, it has had different effects on common and peculiar support equipment. Common support equipment has remained virtually unaffected, as it has effectively employed competition in all phases of the procurement life cycle to compete design and price for many years. Peculiar support equipment acquisition, however, has only recently attempted to use competition as a means of generating alternative designs [Ref. 18]. This is in large part due to its dependency on a developing weapon system and the criticality of operational deadlines. Yet for both, the effectiveness of competition is predicated on a quality Technical Data Package (TDP) including drawings and a genuine effort by the Acquisition Manager to monitor the program closely.

IV. DISCUSSION

A. SUPPORT EQUIPMENT RECOMMENDATION DATA

The Support Equipment Recommendation Data program was established to provide a comprehensive review of proposed support equipment requirements and to ensure that no duplication of support equipment exists. However, the process is, in large part, a manual search of six large files and is severely limited by the lack of qualified personnel to perform the analysis within the time periods mandated by instructions. Even though multiple data bases are searched, there is no consistency in the data elements they contain or the indices used to access them. This lack of consistency may lead to existing items of support equipment being overlooked in the fulfillment of a requirement. The Support Equipment Recommendation Data (SERD) System contains incomplete descriptions of the technical capabilities of the support equipment items because it often uses unapproved names and does not always list the critical performance requirements of all items [Ref. 19: p. 25-26].

Relative to specific listings, The Preferred Avionics and Non-avionics Support Equipment Listings are arranged alphabetically. The Engineering Data Retrieval System is referenced by part number and manufacturer code and the Defense Logistics Service Center preprocurement search is

by national stock number. The alphabetical listing is deceiving in several ways. First, on many occasions an end item is given an unapproved item name, even though it can not yet be described by its physical or performance specifications or easily given a federal stock classification. As a result, it is not uncommon for the same or similar items to receive more than one national stock number and remain in the stock system without ever being cross-indexed. If an approved name for an item can not be determined, the nomenclature suggested by the manufacturer is adopted. These names can often be misleading. For example, a safety pin may be listed alphabetically as a connector. The fact that such items are often unrecognizable leads to the development of unnecessary peculiar support equipment.

The Preferred Avionics and Non-Avionics Listings are just that--listings of those items the Navy would prefer to use. They list only about 5000-6000 items each and are in no way reflective of the quantity of available support equipment.

The Engineering Data Retrieval System (EDRS) is a computerized file which is intended to accurately list all in-use Naval aviation support equipment items. In practice, however, it includes approximately 22,000 items [Ref. 19: p. 25] even though the Navy estimates it currently has in excess of 60,000 separate line items in inventory [Ref. 9]. Thus, the EDRS, which is one of the primary systems to locate

existing support equipment, lists less than half of those support equipment items in use. Additionally, the information about support equipment in use by other services or those items which have been proposed but not approved is limited.

Therefore, even though six data bases are used in the SERD review, it can in no way be considered a complete review because, in the aggregate the data bases are incomplete. As was noted above, the inadequacy of the data base is compounded by the fact that the SERD review is a manual search conducted under specific time constraints. Rather than use an established set of procedures for analysis, it appears that the engineers involved often base their decisions on personal knowledge and experience [Ref. 19: p. 30].

As a consequence of all of the above factors, the SERD process may result in the procurement of unneeded support equipment. One such case occurred on the F-18 project where a new PSE item, the fuel sample drain valve was developed at a cost of $19,500 and a unit cost of $280. The contractor stated that an evaluation of the available sources was conducted and no items were currently available to meet the identified requirement. Subsequent to the procurement of the drain valve adapter, it was discovered that not only were 10 other types of drain valve devices in the supply system, but that the Navy had recently spent $24,000 to develop two similar items for the F-14 under a different name [Ref. 19: p. 16].

For the SERD review process to function effectively, it should employ a current data base that lists all in-use support equipment, their technical capabilities and physical characteristics, and follow a set procedure to evaluate contractor proposals. We suggest that the following changes be implemented to correct these problems:

1. Standardize the information in the existing files and data bases into a single automated data base with a standard format for the data elements. This system should allow support equipment items to be identified by not only nomenclature and part number, but also item description, size, shape, application, and performance specifications.
2. Update the data base to include all in-use and proposed support equipment items. The AMMRL files currently in use provide a possible source for this information. Proposed support equipment items should be carried in this file and appropriately coded. This would allow an individual project access to the information available on the support equipment proposed for other projects which may meet the identified requirement.
3. Establish a specific methodology to follow throughout the SERD review process. It should include, at a minimum, the requirement to screen existing inventories and justify why existing assets are unacceptable.

B. STANDARDIZATION

As early as 1973, the Department of Defense was moving toward the standardization of its equipment. DODD 4120.3, issued on 6 June 1973, established the Defense Standardization Program. The program's objective was to control item proliferation by:

- preventing duplicative and overlapping descriptions of materials and services;
- fostering the use of existing technology and design features to satisfy new equipment and systems requirements;
- establishing uniform type grades, classes, and sizes of items and levels of performance requirements; and,
- developing methods for systematically reviewing inventory items to reduce or eliminate unnecessary varieties and sizes.

Therefore, the overall goal of standardization in DOD is to avoid the proliferation of equipment models designed to perform similar functions. More recently, a 1980 General Accounting Office report estimates that up to 20% of life cycle cost may be eliminated through the use of standardization [Ref. 19: p. 8].

By recognizing the possibility for the use of standardization or common support equipment, each project may benefit in any of the following ways [Ref. 19: p. 7-8]:

- reduced item cost through the use of readily available items;
- reduced assembly and installation costs for items as a result of standard tooling;
- more predictive reliability through the use of items with established service histories;

- reduced number of total types of items requires initial procurement and a subsequent logistics system;
- improved maintenance by eliminating odd or unusual items; and,
- reduction in testing and qualification.

All of these factors contribute to the potential for meeting schedule or cost goals by eliminating different items with similar functions.

Additionally, the end user may benefit from standardization by realizing a reduction in operational and training requirements, a simplification of the logistic support requirements, and a decrease in the number of parts which will be cataloged and stocked to support the new items. However, the benefits to the fleet will only accrue if the common support equipment items are identical in physical design as well as performance. To ensure this occurs, NAVAIR should place particular emphasis on the Technical Data Packages used to develop common support equipment.

NAVAIR has made progress in the standardization of aviation support equipment. For example, in 1971 the Navy inventory included over 127 separate types of aircraft jacks. Through standardization, NAVAIR has reduced the number of aircraft jacks to less than 20, eliminating those which were functionally identical [Ref. 19: p. 37]. Additionally, NAVAIR has developed the Jet Air Start Unit, a common support equipment item which has the technical capability to replace all existing pneumatic start units [Ref. 3: p. C-1].

The efforts to standardize avionics support equipment has been more difficult, since avionics equipment consists of highly complex components and service unique aircraft systems. However, a long term solution to the proliferation of Automatic Test Equipment (ATE), the Consolidated Support System (CSS), is in development. Consisting of a central unit and five supporting systems, it is designed to accommodate virtually all avionics maintenance requirements at the intermediate level thus replacing a significant portion of the ATE in use today.

Within NAVAIR it is the current goal of AIR-552 to increase standardization in the support equipment program through the use of common support equipment. The support equipment acquisition matrix organization has facilitated this goal by allowing the identification of support equipment requirements early enough in the acquisition cycle to influence weapon system design or to allow the development of common support equipment through the modification of existing items.

A recent example for which standardization may have avoided the introduction of unnecessary peculiar support equipment was the ground safety pin on the F-18 canopy jettison system. It was developed at a cost of $13,000 with a resultant unit cost of $15. Even though the unit cost is relatively low, every F-18 aircraft with a canopy jettison has a ground safety lock system secured with these

pins. Although there are 486 ground safety pins in the Federal Catalog and over 70 pins listed in the Engineering Data Retrieval System (EDRS), the request for a new pin for the F-18 was approved. The F-18 pin has a 1/4" diameter, is 3 inches long, and is made of corrosion resistant steel. However, several of the pins used on the F-15 are nearly identical to those requested for the F-18 with a slight change in diameter. If additional planning had been conducted earlier, it may have been possible to use the previously designed pins and alter the design of the aircraft itself to accommodate a slightly larger safety pin. Instances such as these are, in large part, related to the inadequacies of the Support Equipment Requirement Data (SERD) review process, but as weapon systems escalate in cost and as acquisition intervals lengthen, early planning for logistics will become more critical. The continuation of the trend to increase standardization will provide the System Program Manager for Support Equipment with more management flexibility and a cost effective means to efficiently meet operational requirements of the fleet. However, if this trend is continued, NAVAIR should take additional measures to reward the contractor for higher usage of common support equipment.

Additional research is warranted in this area to determine the impact of increased standardization on the support equipment program and fleet readiness.

C. TECHNICAL DATA PACKAGES

Rear Admiral Joseph P. Sansone, Deputy Chief of Naval Material Command (NAVMAT) for Contracts and Business Management, was quoted in 1984 as saying, "If we have and own the necessary drawing rights and technical data, and they're current, we can save an additional 20-25 percent if we can compete the procurement" [Ref. 16: p. 27].

The support equipment program has moved toward an increased use of Technical Data Packages to facilitate the use of competition. This trend toward the use of a Technical Data Package as Government Furnished Property (GFP) gives the System Program Manager for Support Equipment (SPM-SE) an increased flexibility in source selection, but it carries with it additional risks for the government. In particular, when a TDP is provided as GFP, the government becomes directly responsible for its accuracy and completeness. A TDP not only increases the management burden, but its effectiveness is highly dependent on its detail.

As a minimum, a TDP should include Level III Engineering drawings and associated lists in order to provide the amount of information a second source will require to produce a comparable support equipment item. Specifically, the requirements for a Level III drawing are defined as follows:

> Engineering drawings and associated lists prepared to this level shall provide engineering definition sufficiently complete to enable a competent manufacturer to produce and maintain quality control of an item to the degree that physical and performance characteristics interchangeable with those of the original design are

> obtained without resorting to additional product design effort, additional design data, or recourse to the original design activity. [Ref. 20]

By definition, the drawing must be so complete as to allow a second source to produce an item with the same performance and physical characteristics. Therefore, it becomes necessary to validate the TDP prior to its use either through first article testing or another means, as the original manufacturer may not always be able to or wish to release all the information which he has compiled. If the TDP is not validated prior to its use and it is found to be inadequate, inaccurate or incomplete, the government is often forced into a sole source or reverse engineering situation to avoid lengthy and costly research and development.

Finally, since the use of a TDP as Government Furnished Property is a relatively new practice in peculiar support equipment acquisition, additional research should be conducted at a later date to assess its effect on peculiar support equipment cost, project schedule and the use of competition.

D. TECHNICAL EVALUATION

Another critical aspect of the support equipment acquisition process is the technical evaluation (TECHEVAL) required subsequent to full scale development for both common and peculiar support equipment. Technical evaluation is particularly essential to the success of not only the support equipment end item, but also the success of the

weapon system during deployment. To ensure the eventual effectiveness of the support equipment end item, not only must the designated performance specifications be examined during TECHEVAL but the physical design (e.g., size, weight, dimensions) of the support equipment item must also be reviewed. The physical constraints unique to shipboard operations make the physical design of the end item a major concern during TECHEVAL. As a consequence, the TECHEVAL should not be restricted to the efforts at NATC but should always include a FLEETEVAL. The FLEETEVAL would also ensure the end item is compatible with the shipboard environment and verify the ability of a maintenance technician to maintain and/or repair the end item while underway. Contractual measures such as incentive awards based on successful completion of FLEETEVALS should be included in subsequent contracts.

E. COMPETITION

The introduction of increased competition into the support equipment acquisition process has met with varying degrees of success depending on the type of equipment being procured, either peculiar or common support equipment. For a number of years, common support equipment acquisition has used competition in both development and production contracts. As a consequence of good technical data packages being procured, common support equipment acquisition efforts have been particularly successful in competing both design

and price. Also, by using formal advertising whenever possible, NAVAIR has limited the negative byproducts of competition described in Chapter III. Formal advertising allows this by shifting the majority of the risks to the contractor, motivating him to reduce cost and shorten project schedule whenever possible.

Only recently has the peculiar support equipment process begun to include competition as a standard practice. A key element that facilitates competition in the peculiar support equipment production and reprocurement phases is the requirement for the development of a comprehensive Technical Data Package in the initial stages of the life cycle. However, the Technical Data Package does not ensure competition in the development phases when the government has virtually no alternative but sole source procurement. Sole source procurements are used in those situations where only one firm is capable of providing the required item in a timely manner.

In the case of peculiar support equipment development, the lack of a definitized product baseline inhibits competitive procurement prior to the Initial Operational Capability date. However, the F-18 project used phased support to allow for the later delivery of support equipment items. Phased support occurs when contractor support for certain items extends beyond the production phase into weapon system deployment. The use of phased support for

support equipment on weapon system contracts should give the project manager the schedule flexibility to allow for the incorporation of competition into the earlier stages of the acquisition. In phased support cases where deadlines for support equipment Initial Operational Capability are not as critical, the development contract can be competed once the weapon system requirement is defined.

To allow for competition in the production and reprocurement phases of support equipment acquisition, NAVAIR should consider the introduction of a joint development approach on some peculiar support equipment contracts as well as continue the current use of breakouts and second sourcing through Technical Data Packages. The joint development approach to the development of support equipment stimulates the contractors to generate a better and cheaper product. Additionally, the majority of the risk is placed on the contractor, since product performance must be demonstrated prior to acceptance. All the sources should have equal access to product information thus avoiding the many problems historically associated with the technology transfer in second source situations.

There is a risk of increasing the overall program length using this approach. In addition, from the viewpoint of the fleet, the existence of multiple sources does not signify the success of competition, since additional sources may only generate the requirement for additional provisioning,

training, and technical manuals [Ref. 19: p. 37]. There are numerous cases when such a situation occurs. For instance, the P-3 IMRL lists two separate hydraulic servicing units (part numbers 310 and 6630AS100-11) as alternates. Each requires a different set of adapters to perform the maintenance required. Even though both units serve the same function, they differ significantly in physical design. One has a ten-gallon capacity, weighs 145 pounds, and has a volume of 17.4 cubic feet. The other has a capacity of three gallons, weighs 35 pounds and has a volume of 7.9 cubic feet [Ref. 21].

As the support equipment becomes more complex, these problems are compounded. For instance, the Naval Air Station Miramar AIMD IMRL lists several avionics test sets which have multiple alternates. In one case, a test set listed is actually over 15 alternates in which the technology ranges from test tubes to the state of the art. Few of the alternates are produced by the same manufacturer or even serve the same aircraft. As a consequence, maintenance technicians must be trained on all of the sets [Ref. 22].

For joint development to be an effective form of competition NAVAIR should carefully verify the sufficiency of the Technical Data Packages on which the competition will be based to prevent the development of multiple alternates.

F. MATRIX ORGANIZATION

As support equipment has become more costly and complex, there has been an increased emphasis on establishing a more cost effective and efficient acquisition program for the life cycle management of support equipment. NAVAIR has achieved this by creating a matrix organizational structure which integrates the federal policy guidelines for competition and life cycle management into an orderly acquisition process.

Even though the matrix organization is considered one of the most difficult organizational structures to implement, the nature of the support equipment acquisition process lends itself to this type of management [Ref. 5: p. 3]. NAVAIR has effectively used the matrix organization to integrate logistics, engineering, and management expertise into a cohesive systems approach to support equipment acquisition. This is in part attributable to the designation of AIR-552 as a System Program Manager. This recognition of the support equipment program has given AIR-552 an authority which would not necessarily be available at this level in the functional organizational structure at NAVAIR. Additionally, the System Program Manager for Support Equipment is in a position to expand the perspective on the development of support equipment beyond the priorities of a single aircraft project to examine the support equipment requirements of all types of aircraft. One of the benefits of this

approach has been the early identification and development of weapon system integrated logistics support requirements. Finally, close coordination between AIR-417 and AIR-552 provides for the integration of supportability and operational design criteria throughout the weapon system life cycle. Several actions, such as concurrent approval procedures, have been taken to ensure a cooperative effort between AIR-417 and AIR-552. However, in the long run, NAVAIR should continue to provide strong leadership in the System Program Manager for Support Equipment position to sustain the success of the matrix organization.

G. BEYOND NAVAIR

Overall, the NAVAIR efforts to make the support equipment acquisition process a systematic efficient approach to life cycle management appear to be successful. However, additional research should be conducted which compares the NAVAIR support equipment acquisition procedures with those of other Naval Hardware Systems Commands and other services in order to provide a basis for identifying further areas for improvement in NAVAIR and for improving the support equipment acquisition procedures in all DOD agencies.

V. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSION

Support equipment developments in recent years have been characterized by marked increases in capability, complexity, and cost. As a result, there has been an increased emphasis on establishing a cost effective and efficient program for the life cycle management of support equipment. NAVAIR has used a matrix organization to integrate the federal policy guidelines for competition and life cycle management into an orderly acquisition process. Recently, NAVAIR has developed policies that specifically require the use of competition whenever feasible as well as require a maximum use of standardization. One specific step was to encourage the use of Technical Data Packages to permit competitive follow-on procurement.

B. SUMMARY OF RECOMMENDATIONS

1. Recommendation 1

The information in the existing SERD review files and data bases should be consolidated into a single automated data base with a standard format for the data elements. This system should allow support equipment items to be identified by not only nomenclature and part number, but also item description, size, shape, application, and performance specifications.

2. Recommendation 2

The SERD review data base should be updated to include all in-use and proposed support equipment items. The AMMRL files currently in use provide a possible source for this information. Proposed support equipment items should be carried in this file and appropriately coded. This would allow an individual project access to the information available on support equipment proposed for other projects may be applicable to their own requirements.

3. Recommendation 3

A specific methodology should be established for use throughout the SERD review process. It should include, at a minimum, the requirement to screen existing inventories and justify why existing assets are unacceptable.

4. Recommendation 4

To increase the standardization of support equipment, incentive clauses should be included on subsequent weapon system contracts which reward the contractor for the increased use of common support equipment.

5. Recommendation 5

As a minimum NAVAIR should require a Technical Data Package to include Level III Engineering drawings and associated lists to provide the information a second source will require to produce a comparable support equipment item. Additionally, NAVAIR should ensure each Technical Data Package is checked as thoroughly as possible for accuracy and completeness.

6. Recommendation 6

NAVAIR should introduce a joint development approach on some peculiar support equipment contracts as well as continue the current use of breakouts and second sourcing ensure competition during the production and reprocurement phases.

7. Recommendation 7

The TECHEVAL should not be restricted solely to the efforts at the Naval Air Test Center. It should always require a Fleet Evaluation to test the performance of an end item in an operational environment. Contractual measures such as incentive awards based on the successful completion of Fleet Evaluations should be included in subsequent contracts for support equipment.

APPENDIX A

MAJOR WEAPON SYSTEM ACQUISITION PROCEDURES

The Department of Defense Directive (DODD) 5000.1, Major Systems Acquisition, and DODI 5000.2, Major Systems Acquisition Procedures, delineate the procedure for any major system acquisition within the Department of Defense and have precedence over other regulations unless otherwise stipulated by statutory requirements.

The intent of DODD 5000.1 is to ensure major weapon systems are acquired in an efficient and effective manner. This directive promotes the decentralized management of major system acquisition consistent with the delegation of authority to the lowest levels of the component at which a comprehensive view of the program rests. DODD 5000.1 clearly states the DOD acquisition management principles and objectives as follows:

a. Effective design and price competition for defense systems shall be obtained to the maximum extent practical to ensure that defense systems are cost effective and are responsive to mission needs.

b. Improved readiness and sustainability are primary objectives of the acquisition process. Resources to achieve readiness will receive the same emphasis as those required to achieve schedule or performance objectives. As a management precept, operational suitability of deployed weapon systems is an objective of equal importance with operational effectiveness.

c. Reasonable stability in the acquisition programs is necessary to carry out effective, efficient and timely acquisitions. To achieve stability, DOD Components shall:

1. Conduct effective long range planning.

2. Consider evolutionary alternatives instead of solutions at the frontier of technology: for example, Preplanned Product Improvement to reduce risk.

3. Estimate and budget realistically, and fund adequately, procurement (research, development, and production), logistics and manpower for major systems.

4. Plan to achieve economical rates of production, maintain surge capacity and conduct realistic mobilization planning.

5. Develop an acquisition strategy at the inception of each major acquisition that sets forth the objectives, resources, management assumptions, extent of competition, proposed contract types and program structure (such as, development phases, decision milestones, test and evaluation (T&E) periods, planned concurrency, production releases) and tailor the prescribed steps in the major system acquisition decision making process to this strategy. When the acquisition strategy is approved by the DOD Component, changes shall be made only after assessment and consideration of the objectives of this Directive, and of the impact of such changes on the program.

d. To promote efficiency in the acquisition process, authority will be delegated to the lowest levels of the component at which a comprehensive view of the program rests. Responsibility and accountability must be clearly established, in particular, the Military Service program manager shall be given the authority and resources commensurate with the responsibility to execute the program efficiently. Reviews, such as those by the Defense System Acquisition Review Council (DSARC), are a means to evaluate the information required for a decision which higher level authority has specifically reserved and not delegated to the program manager. Reviews will not be used to request data other than those required as a basis for higher authority decisions.

e. A cost effective balance must be achieved among acquisition costs, ownership costs of major systems, and systems effectiveness in terms of the mission to be performed.

f. Cooperation with U.S. allies in the acquisition of defense systems will be maximized to the highest degree of standardization and interoperability of equipment,

and to avoid duplication of effort. Mobilization requirements will be a factor considered in evaluating opportunities for international cooperation (See DOD Directive 2010.6).

g. A strong industrial base is essential for a strong defense. To protect the public interest and foster competition, an ethical distance in business relationships between defense and industry must be maintained, without such buyer-seller relationships becoming adversarial. Technical collaboration with industry must be maintained to achieve major systems acquisition objectives and meet technological challenges. The impact of DOD acquisition on the industrial base must also be considered both for the near term and long range implication. [Ref. 23]

As shown in Figure A-1, there are four distinct phases in the major system acquisition process which are separated by clearly identified decision points or milestones. They are Concept Exploration, Demonstration and Validation, Full Scale Development, and Production and Deployment. The specific procedures and required documentation for each of these phases/milestones are specified in DODI 5000.2. These procedures are tailored for each weapon system acquisition in an effort to minimize the total acquisition time and cost.

With the assistance of the Defense Systems Acquisition Review Council (DSARC), the Secretary of Defense (SECDEF) has the ultimate responsibility for all decisions on matters pertaining to major weapon system acquisition. These decisions are normally promulgated at each milestone in the formal reports.

The Defense Systems Acquisition Review Council is the top level corporate body. The DSARC is responsible for

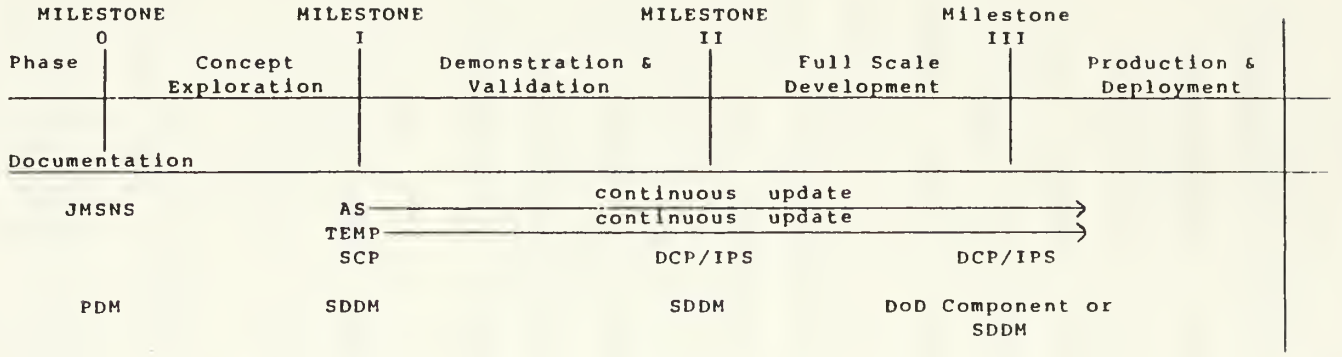


Figure A-1. Major Weapon System Acquisition

advising and assisting SECDEF on matters pertaining to major system acquisition. The DSARC is comprised of the following primary members:

1. Under Secretary of Defense for Research and Engineering (USDRE)
2. Under Secretary of Defense for Policy (USDP)
3. Assistant Secretary of Defense for Manpower, Reserve Affairs and Logistics (ASD(MRA&L))
4. Assistant Secretary of Defense, Comptroller (ASD(C))
5. Director, Program Analysis and Evaluation (DPA&E)
6. Chairman of the Joint Chiefs of Staff
7. Secretary of each of the Military Departments.

The USDRE acts as the Defense Acquisition Executive (DAE) as well as the Chairman of the DSARC [Ref. 23].

DSARC reviews are normally conducted at Milestone I and II or if established monetary thresholds are breached. Milestone III reviews are conducted by the reviewing authority within the specific DOD component unless the DAE specifies otherwise.

The Secretary of Defense designates programs that shall be managed as major systems based upon one or more of the following criteria:

A. Development risk, urgency of need, or other items of interest to SECDEF.

B. Joint acquisition of a system by DOD and another nation, or two or more DOD Components.

C. Congressional interest.

D. A system acquisition that exceeds $200 million (FY 80 dollars) in RDT&E funds or $1 billion (FY 80 dollars) in production funds. [Ref. 23]

Once the need for a major system is identified, the acquisition process is initiated with the promulgation of the Justification for Major System New Start (JMSNS). The JMSNS provides the necessary information for budgeting and planning purposes. Endorsement by SECDEF in a Program Decision Memorandum (PDM) is the basis on which the program is included in the POM. The PDM disseminates any changes to the DOD component recommendation and is required prior to the Concept Exploration Phase. The Program Decision Memorandum authorizes entry into the Concept Exploration Phase when the budget is approved. This procedure is normally referred to as Milestone 0.

At the beginning of the Concept Exploration Phase, a program manager (PM) is designated and his responsibilities, authority, mission, and organizational relationship are defined in a program charter. During this phase, the Acquisition Strategy (AS), Test and Evaluation Master Plan (TEMP), and System Concept Paper (SCP) are developed.

The Acquisition Strategy is the overall plan for the system acquisition and defines the program objectives for the PM. It encompasses technological options, test and evaluation criteria, schedules, industrial base/competition considerations, strategies, contracting options, logistics support, and, manning/training requirements. It serves as

the basis for other program documentation such as the SCP and the TEMP.

The Systems Concept Paper is a summary of the Concept Exploration Phase. It describes the concept that is to be carried into the Demonstration and Validation Phase, the acquisition strategy, reasons for the elimination of alternate concepts, program goals/objectives, and thresholds to be achieved prior to Milestone II.

The initial version of the Test and Evaluation Master plan is published at the completion of the Concept Exploration Phase. The TEMP will include the following:

- System description and intended mission.
- Critical T&E issues, expanding upon those identified in the SCP/DCP.
- Program objective and thresholds.
- Required technical and operational characteristics.
- Integrated schedule, including contractor demonstration, preliminary evaluations, technical evaluations, approval for full production as well as required "standard" development and operational T&E project milestones.
- T&E resources required, including laboratories, ranges, test sites, instructions, major command or fleet support needs, personnel, training, logistics support, and funding by program element and appropriations per fiscal year. [Ref. 24]

Reviews of the TEMP are required annually, and two months prior to major decision milestones. Throughout the remainder of this process these reports are continuously updated to reflect the results achieved, significant changes, and any additional relevant information. These reports conclude the Concept Exploration Phase. The DSARC

reviews these reports and advises the SECDEF on all pertinent matters concerning the system acquisition. The SECDEF publishes a Secretary of Defense Decision Memorandum (SDDM) that includes approval of program goals, cost thresholds, program schedules, performance and sustainability parameters, program guidance, and approval authority to proceed into the Demonstration and Validation Phase.

The Demonstration and Validation Phase identifies the risks and uncertainties for the concept brought forward from the Concept Exploration Phase. In this phase, competitive demonstrations of concepts that have the greatest potential to meet mission needs are further analyzed. This phase assesses the sufficiency of the technology and the industrial base to develop these concepts into reality. Tradeoff decisions between cost, risk and performance are examined in the context of system life cycle cost and management. An Integrated Logistics Support Plan is developed to facilitate life cycle management and the Acquisition Strategy and Test and Evaluation Master Plan are updated to reflect these plans and decisions.

Toward the end of the Demonstration and Validation Phase, and in preparation for the Full Scale Development Phase, contract negotiations and budgeting documentation are prepared. Procurement procedures are initiated for those items requiring long lead times.

Documents prepared at the Milestone II decision point are the Decision Coordinating Paper (DCP) and the Integrated

Program Summary (IPS). These summary documents provide the Defense System Acquisition Review Council with system acquisition information.

The Decision Coordinating paper is a summary of program alternatives, goals, thresholds, and objectives. It describes the acquisition plan and the management objectives of the program.

If the Defense Acquisition Executive determines more information is required than provided by the DCP, the Integrated Program Summary is prepared. It provides more specific program information than the DCP but does not use the DCP as a basis.

These summary documents allow the Defense Acquisition Executive to advise the Secretary of Defense on relevant program decisions for Milestone II. At this point, the Secretary of Defense promulgates a second Secretary of Defense Decision Memorandum that addresses revised program goals, thresholds, objectives, changes, cost, and the authorization for entry into the Full Scale Development Phase.

The Full Scale Development Phase demonstrates the ability of a system to satisfy the defined mission need in the areas of cost effectiveness, reliability, maintainability, and operational suitability. This phase can be broken down into three overlapping subphases: engineering, prototype, and pilot production [Ref. 25].

The engineering subphase establishes system attributes such as reliability, maintainability, and supportability. This is accomplished through the iteration of the design-build-test-redesign steps and the evolution of engineering development models. These models are used to demonstrate the system's sustainability and ability to meet mission needs under operational conditions. This phase defines the engineering parameters and verifies the accuracy of system characteristics prior to fabrication of the first system prototype.

The prototype subphase consists of a build-test-modify-redesign-build-test iteration that refines the previous subphase developmental system. This phase will provide system components for a technical evaluation. The results of this evaluation will provide the basis for final design considerations. Further, critical process specifications, quality assurance procedures, inspection procedures, rework philosophy, and any other instructions necessary for the fabrication of pilot-production models are defined during this subphase.

The pilot production subphase simulates the production of the hardware and software designs through the developed test equipment, hardtooling, and production processes in an actual production environment. It provides a basis for the evaluation of the production of the system, identifies any weaknesses in these processes, and initiates appropriate

actions to correct these weaknesses. The transition to Full Scale Development is marked by a formal Operational Evaluation (OPEVAL) of the alternative systems. An OPEVAL is required for approval for full production.

Milestone III documentation is the same as Milestone II. The Decision Coordinating Paper/Integrated Program Summary are reviewed and the approval authority to enter into the next phase is normally delegated to the DOD component. The program may be subject to formal DSARC review if the Defense Acquisition Executive feels the situation warrants it particularly if monetary thresholds have been exceeded.

The last phase of the acquisition process is the Production and Deployment Phase. The start of this phase is not well defined. Rather, it occurs during the transition from pilot-production to low rate production. Low rate production establishes the accuracy of production concepts and procedures to confirm the product baseline prior to entering full rate production. It also identifies any inadequate design or production process that will not support the desired production rate. Normally the transition into full rate production is through a stepped increase in production. Product stabilization and the proven capability of the contractor must be established during the transition to full rate production. Particular scrutiny is given to per unit manufacturing costs and the amortization of fixed costs.

Weapon system deployment and fleet support consists of the phase in of the new system with concurrent phase out of the old system. The primary ingredient for the successful deployment of a weapon system is the careful planning of weapon system support areas. Fleet support can be factored into three areas--phase-in support, operational support, and phase-out support [Ref. 26]. Phase-in support is normally provided by the contractor and consists of contractor provided training, initial spare parts outfitting, system warranties, establishment of support facilities, and, if necessary, contract maintenance support. The planning for, and contracting of, phase-in support is accomplished at the end of the Full Scale Development Phase.

Operational support is an integral part of the Integrated Logistic Support Plan (ILSP). Initial planning efforts for this phase commence two to three years prior to initiation of procurement. Long lead times are required for the identification of personnel resources required to support the system in the field. This consists of the impact of personnel requirements on manpower authorizations, recruiting, establishment of training pipelines, and the financial planning to support these requirements. Poor planning for operational support can seriously degrade weapon system performance and reliability [Ref. 27]. During this phase continual product improvement will be accomplished to accommodate for changes in the threat assessment,

technology, tactics, deficiencies discovered during OPEVALS/TECHEVALS and initial deployment of the weapon system.

The final stage of the Production and Deployment Phase is the phase out of the weapon system. During phase out, spare part manufacturing ceases, training courses are deleted, and maintenance contracts are terminated. Phase out allows the old system to gradually fade away.

Thus, the major weapon system acquisition, as outlined in DODD 5000.1 and DODI 5000.2, is a phased process which integrates Life Cycle Management (LCM), Integrated Logistics Support (ILS) and Planning, Programming, Budget System (PPBS) procedures to provide an efficient, cost effective, and timely acquisition of a weapon system.

APPENDIX B

SUPPORT EQUIPMENT RECOMMENDATION DATA

Designed to ensure an efficient internal control over the selection process, the development of allowances, and the procurement of support equipment, the SERD identifies a support equipment requirement and the means of satisfying this need. It may be submitted by a weapon system contractor or the Navy to propose a new use for an existing SE item or a new type support equipment for a specific use.

The Data Item Description (DID) UDI-E-21001E, "Data Recommendation Ground Support Equipment," shows the formats and instructions for the completion of the SERD. Figure B-1 shows Part I of the SERD which provides, in technical terms, the actual function which requires support. Figures B-2 and B-3 shows Part II of the SERD which specifies the equipment that will satisfy the identified need.

The approved SERD is used by NAVAIR as the input to the AMMRL file as well as the base loading figures for organizational and intermediate level maintenance requirements by aircraft type. These figures are critical to the quantification of annual support equipment budgeting requirements by aircraft type.

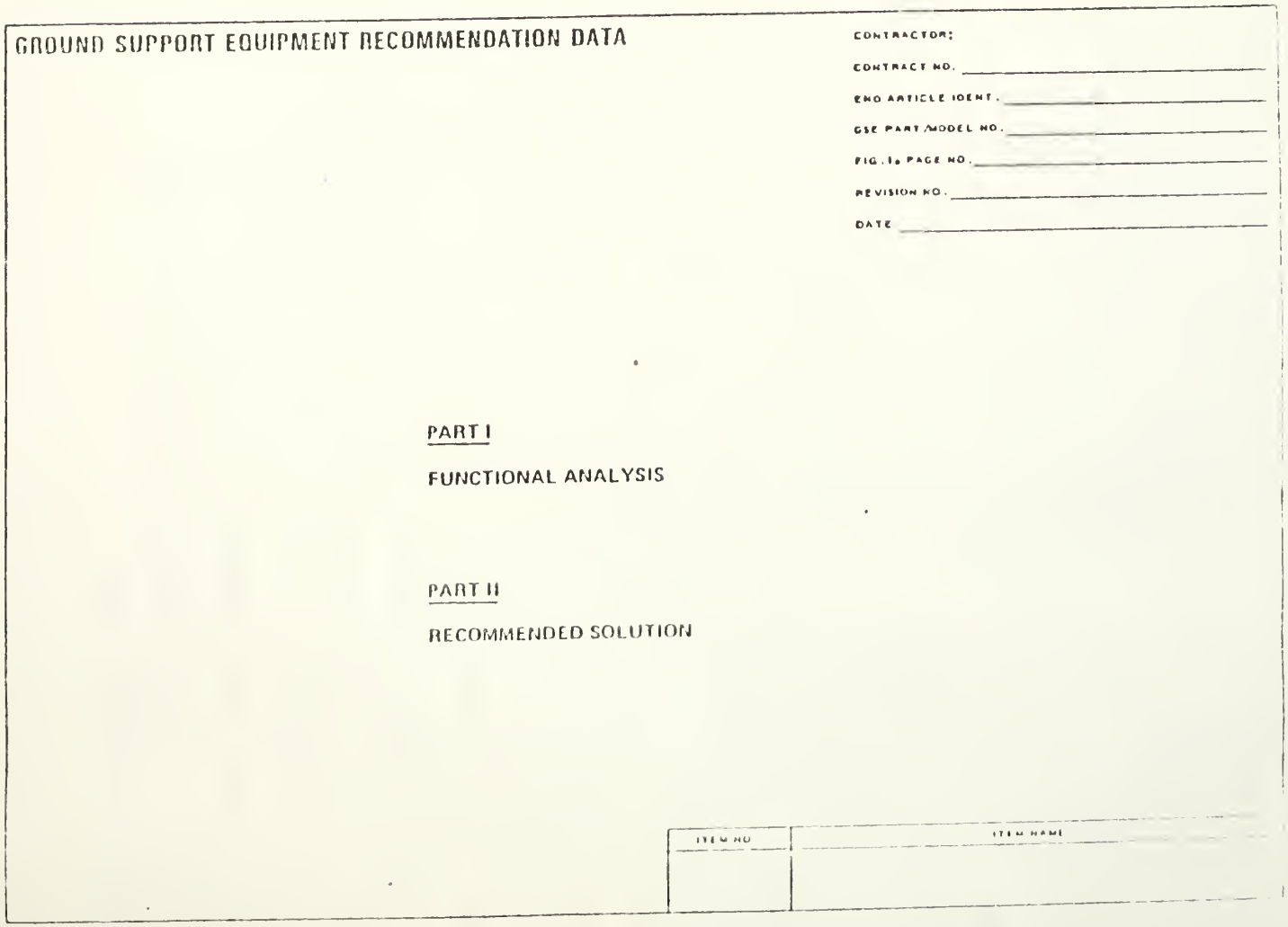
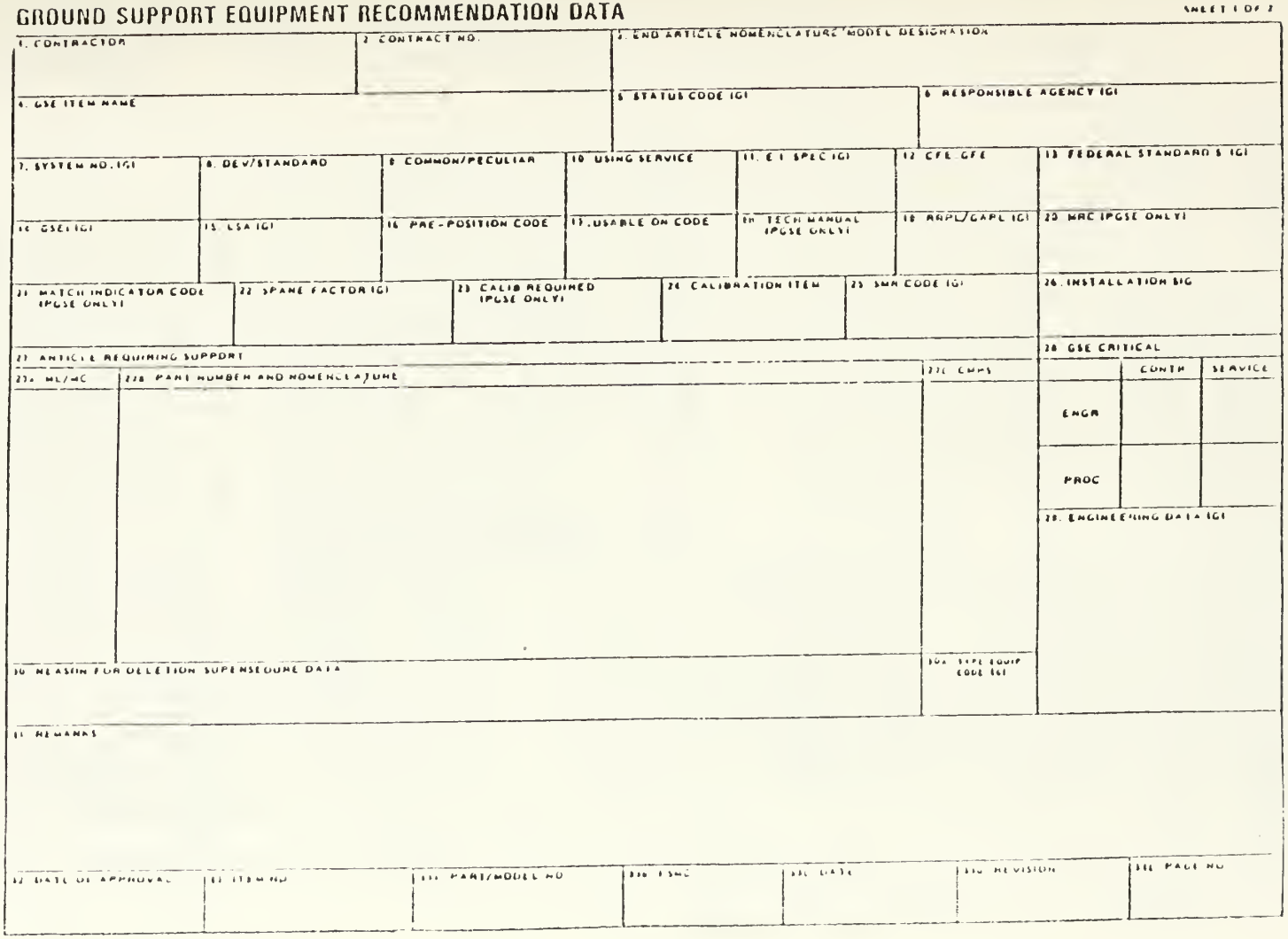


Figure B-1. Ground Support Equipment Recommendation Data, Part I
[Ref. 3: p. E-2]


GROUND SUPPORT EQUIPMENT RECOMMENDATION DATA

SHEET 1 OF 2

1. CONTRACTOR
2. CONTRACT NO.
3. END ARTICLE NOMENCLATURE/MODEL DESIGNATION
4. GSE ITEM NAME
5. STATUS CODE (G)
6. RESPONSIBLE AGENCY (G)
7. SYSTEM NO. (G)
8. DEV/STANDARD
9. COMMON/PECULIAR
10. USING SERVICE
11. E I SPEC (G)
12. CFE GFE
13. FEDERAL STANDARD S (G)
14. GSE (G)
15. LSA (G)
16. PRE-POSITION CODE
17. USABLE ON CODE
18. TECH MANUAL (PGSE ONLY)
19. ANPL/CAPL (G)
20. MRC (PGSE ONLY)
21. MATCH INDICATOR CODE (PGSE ONLY)
22. SPARE FACTOR (G)
23. CALIB REQUIRED (PGSE ONLY)
24. CALIBRATION ITEM
25. SMR CODE (G)
26. INSTALLATION BIG
27. ARTICLE REQUIRING SUPPORT
28. GSE CRITICAL
27a. ML/MC
27b. PART NUMBER AND NOMENCLATURE
27c. CNPS
CONTR
SERVICE
ENGR
PROC
29. ENGINEERING DATA (G)
30. REASON FOR DELETION SUPERSEDURE DATA
30a. TYPE EQUIP CODE (G)
31. REMARKS
32. DATE OF APPROVAL
33. ITEM NO
33a. PART/MODEL NO
33b. FSMC
33c. DATE
33d. REVISION
33e. PAGE NO

Figure B-2. Ground Support Equipment Recommendation Data, Part II
[Ref. 3: p. E-4]

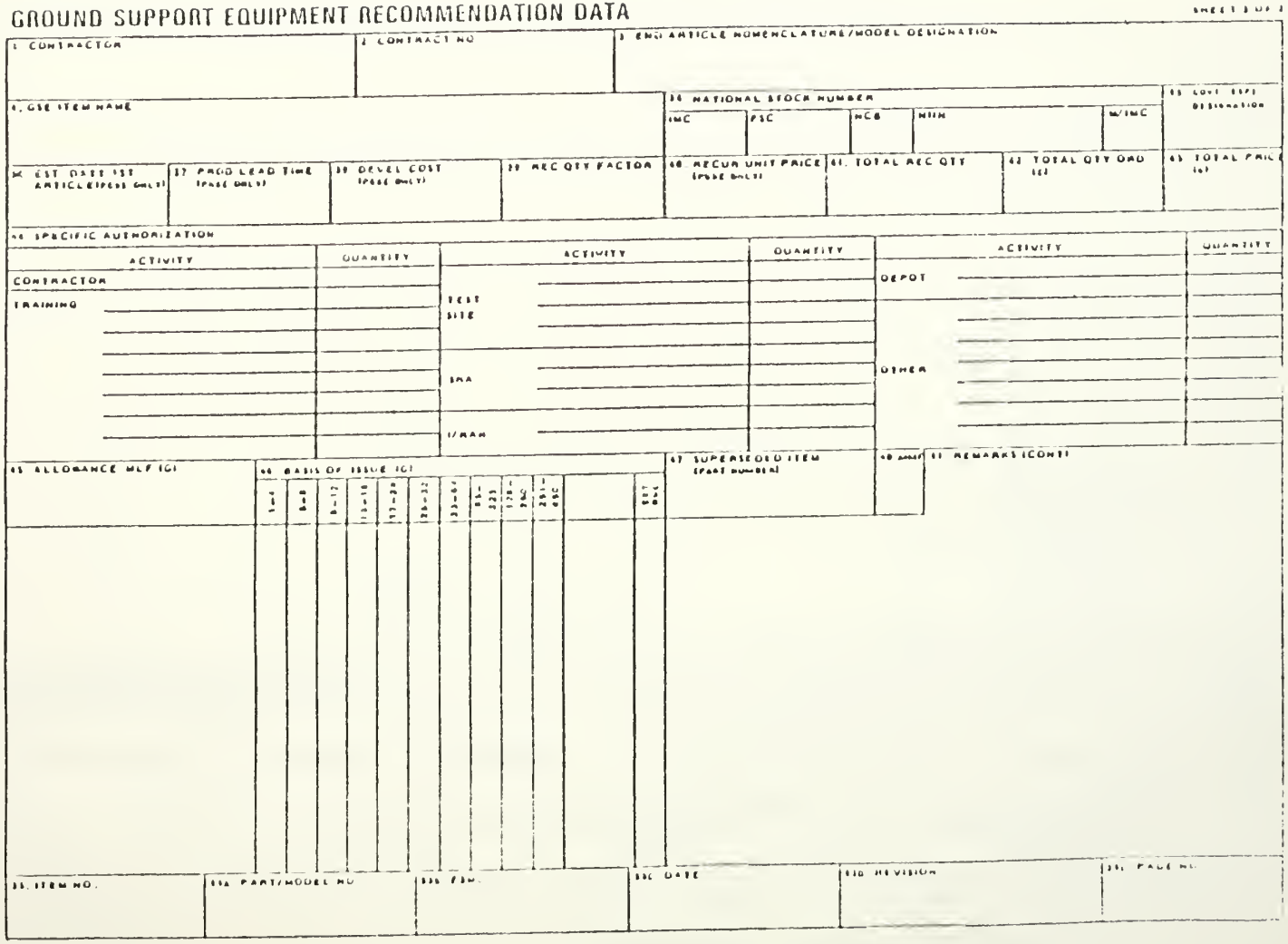


Figure B-3. Ground Support Equipment Recommendation Data, Part II [Ref. 3: p. E-5]

APPENDIX C

FUNDING CODES FOR AVIATION SUPPORT EQUIPMENT AND LIST OF ABBREVIATIONS

A. Research, Development, Testing and Evaluation, Navy (RDT&E,N) Categories:

   6.1 Research

   6.2 Exploratory Development

   6.3 Advanced Development

   6.4 Engineering Development

   6.5 Operational System Development

B. Aircraft Procurement Navy (APN) Categories:

   1. Combat Aircraft

   2. Airlift Aircraft

   3. Trainer Aircraft

   4. Other Aircraft

   5. Modification of Aircraft

   6. Aircraft Spare and Repair Parts

   7. Aircraft Support Equipment and Facilities

LIST OF ABBREVIATIONS

AM	Acquisition Manager
AM-SE	Acquisition Manager for Support Equipment
AMMRL	Aircraft Maintenance Material Readiness List
APM	Assistant Project Manager
APML	Assistant Project Manager for Logistics
APN	Aircraft Procurement Navy

AS	Acquisition Strategy
ASD(C)	Assistant Secretary of Defense, Comptroller
ASD(MRA&L)	Assistant Secretary of Defense Manpower, Reserve Affairs, and Logistics
ASO	Aviation Supply Office
ATE	Automatic Test Equipment
CSE	Common Support Equipment
CSS	Consolidated Support System
DAE	Defense Acquisition Executive
DCP	Decision Coordinating Paper
DID	Data Item Description
DLSC	Defense Logistics Service Center
DOD	Department of Defense
DPA&E	Director, Program Analysis and Evaluation
DSARC	Defense System Acquisition Review Council
ECP	Engineering Change Proposal
EDRS	Engineering Data Retrieval System
FLEETEVAL	Fleet Evaluation
GFP	Government Furnished Property
ILS	Integrated Logistics Support
ILSM	Integrated Logistics Support Manager
ILSM-SE	Integrated Logistics Support Manager for Support Equipment
ILSMT	Integrated Logistics Support Management Team
ILSP	Integrated Logistics Support Plan
IPS	Integrated Program Summary
JMSNS	Justification for Major Systems New Start
LCC	Life Cycle Cost

LCM	Life Cycle Management
LEM-SE	Logistics Element Manager for Support Equipment
LM	Logistics Manager
LM-SE	Logistics Manager for Support Equipment
LORA	Level of Repair Analysis
LRGT	Logistics Requirements Generation Team
LSA	Logistics Support Analysis
MILHDBK	Military Handbook
MIL-STEP	Military Supply and Transportation Evaluation Procedures
NAC	Naval Avionics Center
NAEC	Naval Air Engineering Center
NAVAIR	Naval Air Systems Command
NAVAIRSYSCOM	Naval Air Systems Command
OPEVAL	Operational Evaluation
PCO	Procurement Contracting Officer
PDM	Program Decision Memorandum
PEMP	Program Element Master Plan
PMA	Project Manager, Aircraft
PMT	Project Management Team
PMTC	Pacific Missile Test Center
PPBS	Planning, Programming, and Budgeting System
POM	Program Objective Memorandum
PSE	Peculiar Support Equipment
RDT&E,N	Research, Development, Test, and Evaluation Navy
RILSD	Resident Integrated Logistics Support Department
SCP	System Concept Paper

SDDM	Secretary of Defense Decision Memorandum
SE	Support Equipment
SEARB	Support Equipment Acquisition Review Board
SECDEF	Secretary of Defense
SERD	Support Equipment Recommendation Data
SESA	Support Equipment Selection Analysis
SLEP	Service Life Extension Program
SPM	System Program Manager
SPM-SE	System Program Manager for Support Equipment
TDP	Technical Data Package
TECHEVAL	Technical Evaluation
T&E	Test and Evaluation
TEMP	Test and Evaluation Master Plan
TPS	Test Program Set
USDP	Under Secretary of Defense, Policy
USDRE	Under Secretary of Defense, Research and Engineering
VAST	Versatile Avionics Shop Tester

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